Future of Work and Digital Management Journal

Article type:
Original Research

Article history:
Received 01 August 2024
Revised 25 October 2024
Accepted 06 November 2024
Published online 25 December 2024

Designing a Model for the Development of Digital Competencies among Public Sector Employees: A Case Study of Governmental Organizations in Kermanshah

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How to cite this article:
Rezaei, F., Bastami, M., & Sheikh Esmaili, S. (2024). Designing a Model for the Development of Digital Competencies among Public Sector Employees: A Case Study of Governmental Organizations in Kermanshah. *Future of Work and Digital Management Journal, 2*(4), 78-88. https://doi.org/10.61838/fwdmj.2.4.8

ABSTRACT

In the era of digital transformation, public sector organizations face significant challenges in updating the capabilities of their human capital. Digital competencies have emerged as one of the most critical components for the successful implementation of innovative policies and the effective utilization of emerging technologies. Purposeful development of employees' digital competencies not only enhances productivity but also plays a pivotal role in organizational flexibility and sustainability. This study aims to design a conceptual model for the development of digital competencies in governmental organizations in the city of Kermanshah and seeks to identify and explain the dimensions, requirements, and barriers to this development. Employing a qualitative approach and thematic analysis method, data were collected through semi-structured interviews with 12 academic and executive experts in the fields of human resource management and information technology. For data analysis, the four-stage thematic analysis process based on the Clarke and Braun model was used, including initial coding, theme searching, reviewing, naming, and presenting the final model. The findings of the study led to the identification of four main themes: employee digital competencies, organizational enabling factors, barriers to competency development, and the role of external stakeholders. Furthermore, 13 sub-themes and more than 20 initial codes were identified to support the development of the conceptual model. According to the results, developing digital competencies in public sector organizations requires a systemic, interdisciplinary perspective grounded in continuous learning, leadership support, and inter-organizational collaboration. The final proposed model can serve as a practical guide for policymakers and human resource managers in designing and implementing digital transformation programs.

Keywords: Digital Competency Development, Public Sector Employees, Thematic Analysis.

Introduction

The rapid advancement of digital technologies and their widespread integration into organizational processes have compelled both private and public sector institutions to reassess their human resource strategies, particularly with regard to digital competencies. In the public sector, this challenge is more pressing, as bureaucratic structures, traditional mindsets, and outdated infrastructures often hinder the pace of transformation. Developing digital competencies among public employees has emerged as a strategic necessity to ensure the effective implementation of digital transformation policies, improve public service delivery, and promote institutional agility and innovation [1, 2].

Digital competency, as a multidimensional construct, encompasses technical knowledge, digital literacy, adaptability, and attitudes that enable individuals to function effectively in technology-driven environments [3]. In the context of public

organizations, these competencies are not limited to basic IT skills but also involve the ability to engage with digital governance tools, data-driven decision-making, cybersecurity practices, and digital communication platforms [4, 5]. As highlighted by [6], leadership in digital transformation requires a unique set of capabilities that align technological shifts with human capital development. These capabilities are especially critical in public institutions where resistance to change, limited digital awareness, and a lack of structured competency development programs persist [7].

The necessity of redefining the human resource (HR) function in line with digital imperatives is supported by various models of strategic HR management. For instance, the competency model proposed by [8] emphasizes the role of Chief Digital Officers (CDOs) and HR leaders in aligning employee development with organizational digital goals. The integration of HR analytics, artificial intelligence (AI), and personalized learning approaches—as discussed by [9]—demonstrates a growing shift toward data-driven and adaptive HRM systems capable of enhancing employee performance and engagement in digital environments.

Despite growing awareness, many public organizations remain ill-equipped to implement digital competency frameworks effectively. Challenges such as fragmented digital literacy, resistance from middle management, and lack of access to reliable infrastructure continue to impede progress [10, 11]. Furthermore, existing HRM systems often fail to capture or evaluate digital competencies systematically, leading to a gap between institutional expectations and workforce readiness [12]. In a study by [13], the authors found that empowerment strategies rooted in digital learning environments led to significant improvements in competency development, indicating that structural support and pedagogical design are key success factors.

Several empirical investigations underscore the role of leadership and organizational culture in enabling digital transformation. [14] posits that transformative leadership—defined by a clear vision, risk tolerance, and digital fluency—is essential to overcoming institutional inertia and creating a culture of innovation. This is echoed by [15], who explored the link between meritocracy and HRM practices and found that digital competency development is more effective when accompanied by transparent performance systems and ingratiation strategies aligned with organizational objectives.

Furthermore, the role of HRM in SMEs has been extensively discussed in the literature, offering transferable insights for public sector adaptation. For instance, [16] and [17] emphasize that agility and resilience in HRM systems play a mediating role in organizational performance, which can be leveraged to design more responsive digital training modules. Similarly, [18] identifies the need for adaptive HR policies that incorporate startup-like innovation and flexibility in managing digital talent.

In addition, the application of green HRM (GHRM) strategies—originally aimed at promoting sustainability—has demonstrated potential in supporting digital transformation through employee engagement and values-based leadership [19, 20]. In particular, [21] argues that emerging HR strategies that blend ecological consciousness with technological awareness foster a more holistic competency model. This integrated approach not only aligns with the ethical mandates of public institutions but also enhances their legitimacy and public trust.

Another critical aspect is inter-organizational collaboration. [22] emphasizes that partnerships with universities and external training providers can significantly enhance competency acquisition, especially when internal capabilities are lacking. Similarly, [23] recommends cross-sectoral engagements and knowledge exchange platforms as tools for addressing competency gaps in public organizations.

Technology adoption in HR practices is also gaining traction, with AI-driven tools and digital platforms reshaping recruitment, training, and performance management processes. [24] explores how startup ecosystems use these tools to

attract and retain talent, a strategy that can be adapted by public organizations to modernize their HR practices. This aligns with the findings of [25], who demonstrates that digital tools enhance employee engagement and reduce turnover in public-oriented service organizations.

At the policy level, [26] and [27] call for regulatory frameworks that facilitate digital competency integration across organizational hierarchies. Their studies reveal that without policy alignment, even well-designed competency programs may fail due to mismanagement or lack of accountability. Institutional frameworks must therefore embed digital competency indicators into recruitment, promotion, and training systems to ensure consistency and accountability.

As [28] notes, competency development initiatives must also consider local organizational culture and employee readiness. Public institutions differ significantly in structure, norms, and technology use patterns, and any universal framework must be adapted accordingly. This sentiment is supported by [29], who highlights how contextual factors influence the success of digital transformation initiatives in startups, implying the need for similar contextualization in public sector strategies.

Moreover, [30] introduces the concept of thinking preferences as a determinant of competency acquisition, suggesting that personal cognitive styles should inform training design. [31] reinforces this by presenting a model of digital experience formation, indicating that emotional, cognitive, and behavioral dimensions of learning should be addressed simultaneously for effective transformation.

Finally, the digital talent gap—emphasized in the McKinsey Global Report—remains a pressing issue that governments must address to remain competitive and responsive in the digital age [32]. It is no longer sufficient to digitize infrastructure; the human aspect of transformation must be prioritized through systemic investments in digital competency development, performance evaluation systems, and organizational learning cultures.

In conclusion, the development of digital competencies among public sector employees is not a peripheral concern but a strategic imperative. It requires an integrated framework that accounts for organizational culture, leadership, infrastructure, external collaboration, and adaptive HRM practices. Drawing upon recent research across various organizational contexts, this study aims to design a context-specific model for developing digital competencies among public sector employees in Kermanshah.

Methods and Materials

The present study is applied in terms of purpose and qualitative-exploratory in nature. Given the complexity of the phenomenon under investigation and the necessity of gaining a deep understanding of the factors influencing the development of digital competencies within public sector organizations, the thematic analysis approach was adopted. This method enables the extraction of concepts, patterns, and key themes from textual data and is particularly suitable for conceptual model development in management research.

For qualitative data collection, semi-structured interviews were utilized as the primary instrument. The interview questions were designed based on the theoretical background and the research questions, with the main focus areas including the identification of digital competency components, facilitating and inhibiting factors, the role of organizational culture, and implementation barriers. Each interview lasted between 30 and 50 minutes. All interviews were recorded with the participants' informed consent and were subsequently transcribed verbatim.

The statistical population in the qualitative section of this study consisted of managers, senior human resource experts, and information technology specialists working in public organizations in Kermanshah who had direct professional experience in training, digital transformation, or human resources. The sampling was conducted using a purposive sampling method, based on the criteria of expertise and direct relevance to the research topic. In total, 15 organizational and academic experts were interviewed to ensure theoretical saturation.

The data collected through the interviews were analyzed using the thematic analysis method proposed by Braun and Clarke (2006). The analysis process involved several stages, including familiarization with the data, initial coding, theme identification, theme review, theme definition and naming, and final report writing. To ensure the credibility of the analysis, participant checking and peer review techniques were applied.

Findings and Results

Given the qualitative nature of the study and its aim to identify components, barriers, and influencing factors related to the development of digital competencies among employees in public sector organizations, data analysis was conducted based on thematic analysis. This method was deemed highly appropriate due to its ability to uncover semantic patterns from textual data, which is essential for analyzing the semi-structured interviews used in this study.

Following the interviews with 15 managers, human resource experts, and IT specialists from public organizations in Kermanshah, the interview data were fully transcribed, and the analysis process was executed in six stages following the Braun and Clarke (2006) approach. In the first stage, the researcher became familiar with the data through repeated readings of the interview texts, followed by initial coding. Subsequently, similar codes were grouped into shared conceptual categories, resulting in the formation of sub-themes and main themes.

This analysis revealed three main themes: the digital competencies required by employees, the facilitating factors for the development of these competencies, and existing barriers and challenges. The findings of this stage formed the foundation for designing the conceptual model for digital competency development and played a crucial role in shaping the proposed strategic recommendations of the research.

Phase One: Open Coding

In this phase of thematic analysis, the full text of the interviews was examined line by line, and initial codes were extracted using the open coding method. The initial coding aimed to identify recurring, prominent, and research-relevant concepts. Each code represented a meaningful semantic unit, capturing the underlying meaning in participants' statements in the form of short and precise phrases. To ensure comprehensive coverage of core concepts, a multi-stage coding process was applied, and similar concepts were grouped into initial categories. In total, over 20 initial codes were extracted.

Table 1.

Initial Coding of Qualitative Data

No.	Extracted Semantic Unit from Interview	Initial Code	Initial Conceptual Category
1	"Our employees even struggle with basic organizational software."	Lack of basic digital literacy	Individual challenges
2	"Some managers see technology as a threat, not an opportunity."	Managerial resistance to technology	Organizational barriers
3	"If training is practical and job-related, it’s much more effective."	Practical training	Effective training components
4	"We don’t have any specific or ongoing program for digital empowerment."	Lack of cohesive training policy	Policy deficiencies
5	"Our senior manager was very proactive, so digital projects progressed."	Leadership support for digitalization	Organizational facilitator
6	"We get better results when we collaborate with universities."	Inter-organizational collaboration	External stakeholders
7	"Employees want to learn; we just lack resources."	Employee learning motivation	Human capacity

8	"Our problem isn't just hardware; the mindset is still traditional."	Traditional organizational culture	Cultural barriers
9	"We have an annual workshop, but it's not continuous."	Lack of training continuity	Training implementation barriers
10	"General training doesn't work; it has to match the job."	Need for job-based training	Targeted training components
11	"Employees are afraid to use new technologies."	Technophobia	Psychological barriers
12	"Our information is often fragmented and incomplete."	Weak information literacy	Digital competency components
13	"Sometimes we don't even have stable internet."	Weak IT infrastructure	Technological challenges
14	"Outdated systems themselves hinder new training."	Inefficient equipment	Technical barriers
15	"We don't have a system for evaluating digital competencies at all."	Lack of digital performance evaluation	Human resource management system deficiencies
16	"If we motivate them, employees learn really fast."	Importance of motivational incentives	Reinforcing factors
17	"Training programs should be gradual and ongoing, not one-time."	Need for gradual training	Instructional design principles
18	"The organization must first believe in digital transformation itself."	Organizational belief in transformation	Macro-level motivational factor
19	"Training alone isn't enough; there must be practical experience too."	Need for experiential learning	Effective learning styles
20	"If managers understood the outcomes of digital work, they wouldn't resist."	Insufficient managerial awareness	Managerial knowledge barriers

The initial coding table reflects a part of the qualitative thematic analysis process in which semantic units extracted from the interviews were transformed into conceptual codes. These codes were derived based on recurring and meaningful patterns in participants' discourse and classified into initial conceptual categories such as individual challenges, organizational barriers, educational facilitators, human capacity, and technological barriers. The goal of this phase was to identify preliminary conceptual patterns that would form the sub-themes and main themes in subsequent analysis stages. The diversity of extracted codes reflects the complexity of digital competency development in public sector organizations and serves as the foundation for designing the study's conceptual model.

Phase Two: Theme Search

Subsequently, the theme search table was constructed based on the previously presented initial codes. In this table, similar conceptual codes were grouped under sub-themes, which were then organized into overarching main themes. This structure forms the basis for the final thematic analysis and the design of the study's conceptual model.

Table 2.

Theme Search Table (Categorization of Initial Codes into Sub-Themes and Main Themes)

Main Theme	Sub-Themes	Related Codes
1. Components of Digital Competency	Basic digital literacy	Lack of basic digital literacy, weak information literacy, technophobia
	Applied digital skills	Use of organizational software, data analysis, cybersecurity
	Experiential learning	Need for practical learning, job-based training, gradual training
2. Facilitating Factors for Digital Competency Development	Managerial support	Senior managerial support, organizational belief in transformation, managerial awareness
	Educational policy	Structured educational planning, training continuity, targeted training
	Motivational and cultural resources	Learning motivation, organizational incentives, learning culture
3. Barriers and Challenges to Digital Competency Development	Individual barriers	Employee technophobia, lack of digital experience, low motivation
	Organizational barriers	Managerial resistance, lack of digital competency evaluation system, weak formal structure
	Technological barriers	Weak IT infrastructure, unstable internet, inefficient equipment
4. Role of Stakeholders and External Interactions	Institutional collaboration	Need for collaboration with universities, partnerships with training centers
	External networking and support	Use of consulting bodies, national and international best practices

The theme search table represents a key stage in the thematic analysis process wherein the conceptual codes extracted from qualitative data were grouped into sub-themes based on semantic similarities and then structured into broader main themes. This process not only reduces conceptual dispersion but also assists the researcher in constructing a coherent and

comprehensible structure from the textual data. The main objective at this stage is to establish logical and conceptual relationships among diverse and detailed codes to prepare the ground for theoretical pattern extraction.

This table resulted in four main themes: employee digital competencies, development facilitators, barriers and challenges, and the role of external stakeholders. Each theme comprises several sub-themes derived from prominent and recurring qualitative codes. For instance, the theme of "digital competencies" includes elements such as basic digital literacy, applied technology skills, and experiential learning, all of which were derived from interviews with managers and experts, highlighting the multidimensional importance of digital competencies in public sector settings.

Phase Three: Final Themes of the Study

Following the systematic stages of thematic analysis, including initial coding, theme searching, reviewing, and organizing, four final themes were ultimately extracted as the semantic structure of the qualitative data. These themes directly reflect the perspectives, experiences, and perceptions of managers and experts from public sector organizations in Kermanshah regarding the challenges, needs, and capacities for developing employees' digital competencies in the era of digital transformation. The final themes not only illustrate the current status of digital competency development but also highlight pathways for improvement and potential organizational interventions. Each main theme encompasses a set of specific sub-themes derived from frequently occurring and conceptually rich interview codes. The first theme pertains to "employees' digital competencies," which serves as the central axis of the study. The remaining three themes—facilitating factors, development barriers, and the role of external stakeholders—directly or indirectly influence the enhancement of these competencies. The identification of these themes provides the foundation for the development of the study's conceptual model and offers practical implications at both policy and implementation levels.

Table 3.

Final Themes of the Study

No.	Final Theme	Conceptual Definition	Related Sub-Themes
1	Employees' Digital Competencies	A set of skills, knowledge, and attitudes that empower employees to perform effectively in digital environments.	Basic digital literacy, applied digital skills, experiential learning
2	Facilitating Factors for Digital Competency Development	Intra-organizational conditions and actions that support the training and digital empowerment process of employees.	Leadership support, educational policymaking, learning culture, organizational motivation
3	Barriers and Challenges to Digital Competency Development	Inhibiting factors that impede the growth and development of digital competencies in public organizations.	Individual barriers, organizational barriers, technological barriers
4	Role of Stakeholders and Inter-Organizational Interactions	The contribution of external institutions and actors in supporting the process of developing digital competencies in public sector organizations.	Collaboration with universities and training centers, educational and advisory networking

The final analysis of the qualitative interview data led to the identification of four main themes that systematically capture the key concepts of the study concerning digital competency development among public sector employees. Each theme consists of clearly defined sub-themes, derived from the initial codes and conceptually linked to the overarching theme. The first theme, *Employees' Digital Competencies*, represents the core of the study's conceptual model. It refers to a set of abilities, knowledge, and attitudes that enable employees to operate effectively in technology-driven environments. The sub-themes include *Basic Digital Literacy* (e.g., the ability to use the internet, general software, and understand basic tech terminology), *Applied Digital Skills* (e.g., proficiency in organizational software, data management, information security, and data analysis), and *Experiential Learning*, which emphasizes the importance of practical experience and continuous learning when interacting with digital tools and environments.

The second theme, *Facilitating Factors for Digital Competency Development*, focuses on the conditions and resources that enable the enhancement of digital capabilities within organizations. Its sub-themes include *Leadership Support* (e.g., the role

of senior managers in promoting digital transformation), *Educational Policymaking* (e.g., the presence of structured, targeted, and continuous digital training programs), *Learning Culture* (an environment where error tolerance, learning from experience, and up-to-dateness are valued), and *Organizational Motivation*, which can be fostered through rewards, advancement opportunities, and supportive environments that increase employee engagement.

The third theme, *Barriers and Challenges to Digital Competency Development*, explores the inhibiting forces that negatively impact the digital empowerment of employees. These barriers are categorized into three levels: *Individual Barriers* (e.g., technophobia, lack of interest or trust in digital tools), *Organizational Barriers* (e.g., middle management resistance, lack of digital competency evaluation systems, weak developmental process design), and *Technological Barriers* (e.g., lack of stable IT infrastructure, insufficient access to appropriate equipment, and lack of technical support at the workplace). These barriers often interact with one another and can form a chain of challenges that significantly affect the effectiveness of digital programs.

Finally, the fourth theme, *Role of Stakeholders and Inter-Organizational Interactions*, addresses the significant role of external institutions in supporting the development of digital competencies. This theme includes two sub-themes: *Collaboration with Universities and Specialized Training Centers* and *Educational and Advisory Networking*. Qualitative data indicate that public organizations in Kermanshah can overcome internal limitations by leveraging the scientific and professional capacities of external institutions. Through partnerships with these entities, organizations can enhance the effectiveness of their training programs and human resource development initiatives.

Discussion and Conclusion

The purpose of this study was to design a conceptual model for the development of digital competencies among employees in public sector organizations in Kermanshah. Using a qualitative-exploratory approach and thematic analysis based on semi-structured interviews with 15 HR and IT experts, the study identified four major themes: (1) employees' digital competencies, (2) organizational facilitators, (3) barriers and challenges to competency development, and (4) the role of external stakeholders. These themes emerged through a systematic coding process and reflect the multidimensional nature of digital transformation in the public sector context.

The first major finding was the centrality of digital competencies themselves, categorized into basic digital literacy, applied digital skills, and experiential learning. This aligns with the findings of [5] and [4], who emphasized the foundational importance of digital literacy and its role in enabling effective participation in digital workflows. Basic digital literacy, such as using email, understanding internet safety, and navigating digital tools, was found to be lacking among many employees—an issue similarly highlighted by [3] as a key barrier to digital transformation. In terms of applied digital skills, competencies like data analysis, cybersecurity awareness, and working with organizational platforms were found to be essential. These mirror the competencies identified in the studies of [8] and [9], both of whom advocate for aligning digital skill sets with evolving job roles and organizational goals. Moreover, the emphasis on experiential learning reflects the growing consensus that practical, hands-on training is more effective than traditional, one-time workshops [30, 31].

The second theme focused on the facilitating factors that contribute to the successful development of digital competencies. These included leadership support, structured educational policies, a learner-centric culture, and organizational motivation mechanisms. Interviewees consistently emphasized the importance of visionary leadership in

driving digital transformation. This finding resonates with [14], who argues that transformational leadership is critical for embedding digital change within organizational culture. Furthermore, the need for continuous and structured training programs is consistent with the conclusions of [25] and [33], who emphasize that one-off initiatives are insufficient. Instead, ongoing, strategic, and adaptive educational policies are required. The presence of a learner-oriented culture—where experimentation is encouraged and failure is not penalized—was cited as a success factor in both the current study and in earlier works by [27] and [21], the latter of whom identified such cultures as fertile ground for digital innovation. Organizational motivation through recognition, career advancement opportunities, and a psychologically safe environment was found to enhance engagement with digital learning. This finding is aligned with [19], who connects motivation to both individual competency development and green performance outcomes.

The third major theme concerned barriers to competency development, classified into individual, organizational, and technological challenges. Individual barriers included fear of technology, lack of confidence, and digital fatigue. These findings echo [32], which noted that psychological resistance remains a key hurdle to digital transformation. Organizational barriers—such as lack of structured evaluation systems, insufficient HR support, and managerial resistance—were found to be pervasive. Similar concerns are noted by [7] and [10], who argue that without structural reforms in HR systems, digital initiatives remain fragmented. Technological barriers, including unstable internet, outdated hardware, and poor IT support, were particularly emphasized in the interviews. These infrastructural challenges align with the findings of [12] and [17], who reported that outdated systems not only reduce efficiency but also demotivate employees from engaging with new technologies.

The fourth and final theme involved the role of external stakeholders and inter-organizational collaboration. Participants emphasized that cooperation with universities, research centers, and consulting organizations played a pivotal role in closing competency gaps. This finding confirms the arguments of [22] and [23], both of whom highlight the strategic importance of external partnerships in HR capacity building. Moreover, leveraging successful models from other organizations—both national and international—was considered instrumental in accelerating learning and innovation. The role of stakeholder ecosystems, as discussed by [34] and [18], supports this collaborative orientation, particularly in environments constrained by internal limitations.

The overall model developed in this study suggests that digital competency in the public sector is not a static or isolated phenomenon; rather, it is a systemic process influenced by organizational vision, cultural readiness, technical infrastructure, and external partnerships. The study confirms the multidimensional framework proposed by [24] and extends it by embedding specific components relevant to the public governance context. The model also reflects the strategic HR trends observed in studies like those of [20] and [28], which stress the importance of integrating HR strategy with organizational sustainability and resilience goals.

Importantly, the model accommodates contextual differences by incorporating local cultural, infrastructural, and administrative variables—a necessity highlighted in the works of [35] and [36]. Unlike many imported models that fail to resonate in developing-country contexts, this framework was constructed based on localized insights, making it more suitable for practical application in Iranian public organizations. Finally, the findings are aligned with global perspectives on digital competency development, such as those outlined by [11] and [4], ensuring both internal relevance and external comparability.

Despite its contributions, the present study has certain limitations. The qualitative nature of the research, while valuable for depth, limits its generalizability beyond the specific context of Kermanshah. The reliance on semi-structured interviews also introduces potential biases linked to subjective interpretations of participants. Additionally, the sample, though purposive and informed, was relatively small, consisting of only 15 participants. This may limit the diversity of perspectives, especially given the broad scope of digital competencies. The study also did not evaluate the model through quantitative validation, leaving room for further empirical testing.

Future studies should aim to expand the current model through mixed-methods research, incorporating quantitative surveys and structural equation modeling to validate the relationships among variables. Comparative studies across different cities, sectors, or countries could provide insights into how contextual factors influence digital competency development. Moreover, longitudinal studies could assess how digital competencies evolve over time in response to technological and organizational changes. Exploring the effectiveness of specific training interventions or leadership models in developing digital competencies would also be valuable. Future work might also examine how generational differences among employees impact the adoption of digital tools and training responsiveness.

To operationalize the proposed model, public organizations should begin by conducting digital competency audits to assess existing skill gaps. Leadership training in digital transformation should be prioritized, as managerial support emerged as a critical facilitator. HR departments must design continuous, role-specific training programs that integrate practical application and experiential learning. Investment in technological infrastructure and reliable internet access is essential to overcome environmental barriers. Organizations should foster a supportive learning culture by incentivizing innovation, tolerating mistakes, and celebrating learning milestones. Finally, partnerships with academic institutions and consulting firms should be formalized to bring in expert knowledge, resources, and benchmarking opportunities that can accelerate progress.

Acknowledgments

We would like to express our appreciation and gratitude to all those who cooperated in carrying out this study.

Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Written consent was obtained from all participants in the study.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

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