Testing a Structural Relationship Model of Perceived Organizational Support and Teamwork Skills in Teachers: The Mediating Role of School Collaborative Culture

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ABSTRACT

The purpose of this study was to examine the structural relationship model among perceived organizational support, school collaborative culture, and teamwork skills in high school teachers in Qom. Additionally, the mediating role of school collaborative culture in the relationship between organizational support and teamwork skills was assessed. The study sample consisted of 380 teachers in the field of educational sciences. Data were collected using the Teamwork Skills Questionnaire (Cumming et al., 2015), the Perceived Organizational Support Questionnaire (Rhoades & Eisenberger, 2002), and the Learning Community Culture Index (LCCI 4.0). Data analysis was conducted in two stages: descriptive and inferential. In the descriptive stage, mean, standard deviation, skewness, kurtosis, and correlation coefficients were calculated, and normality indices were examined using the Shapiro–Wilk and Kolmogorov–Smirnov tests. In the inferential stage, structural equation modeling (SEM) and model fit indices were applied. The findings showed that perceived organizational support had a direct and positive effect on teamwork skills, and school collaborative culture played a significant mediating role in this relationship. The results indicate that strengthening organizational support and fostering a collaborative school culture can enhance teachers' teamwork skills and contribute to improving schools' collective performance.

Keywords: perceived organizational support, teamwork skills, school collaborative culture, structural equation modeling (SEM), high school teachers

Introduction

In today's knowledge-driven and innovation-oriented educational landscape, schools are increasingly required to cultivate collaborative and supportive professional environments to improve teacher effectiveness and collective instructional capacity. Among the key organizational and cultural drivers shaping teacher performance, *perceived organizational support* and *school collaborative culture* have emerged as two interdependent forces that influence how educators engage with teamwork and shared professional practice (1). Teachers' ability to work effectively in teams is not merely a personal skill but an

organizational capability fostered by supportive leadership structures and a culture that values mutual trust, shared goals, and collective problem-solving (2, 3). Strengthening these dynamics has become an essential strategy for schools seeking to address complex instructional challenges, implement curriculum innovation, and respond to students' evolving needs (4, 5).

Perceived organizational support (POS) represents the degree to which teachers believe that their school values their contributions and cares about their well-being (6, 7). This construct is deeply rooted in organizational support theory, which suggests that when employees perceive genuine recognition and concern, they reciprocate with higher levels of engagement, commitment, and extra-role behaviors. For teachers, strong POS can translate into greater motivation to collaborate, share expertise, and invest energy in collective instructional improvement (1). Empirical evidence shows that POS is linked to job satisfaction, self-efficacy, and retention in the educational sector (6), while new studies demonstrate its broader impact on job performance and collaborative engagement among teachers (7). In resource-constrained school environments, supportive leadership and fair recognition systems are essential for reducing occupational stress and encouraging teachers to participate in shared professional activities (4).

Parallel to organizational support, the concept of school collaborative culture has gained increasing attention as a mediating mechanism through which organizational practices influence teacher outcomes. Collaborative culture refers to the shared norms, trust, and joint responsibility among staff that promote collective learning and coordinated instructional action (1, 2). Schools with a strong collaborative culture encourage teachers to co-plan lessons, observe peers, provide constructive feedback, and collectively address students' learning needs (3, 8). This climate also enhances teachers' adaptive capacity to engage in complex problem-solving and reform implementation (9, 10). Moreover, collaborative environments help mitigate professional isolation, which is often cited as a barrier to innovation and teacher well-being (5).

Teamwork skills are at the heart of this interplay. Defined as a set of interpersonal, communication, and task-oriented competencies that enable educators to work interdependently, teamwork skills have a direct influence on instructional coherence and student achievement (1, 11). Studies on collaborative learning and co-teaching reveal that teachers who effectively coordinate and communicate within professional communities can design richer learning experiences and reduce subject-specific anxieties among students (12, 13). For example, collaborative teaching methods in mathematics have been shown to improve both student attitudes and academic performance while reducing anxiety (12, 13). Likewise, teacher teams that maintain open discourse and recognize each member's contributions are better positioned to support students in challenging domains such as geometry and problem-solving (8, 10).

Yet, while the value of teamwork and collaboration in schools is widely acknowledged, research suggests that effective teacher teamwork does not emerge spontaneously. It is shaped by the surrounding organizational support and reinforced through the culture of collaboration within the school (2, 3). When teachers feel recognized and trusted by their organization, they are more likely to contribute proactively to shared professional goals (6, 7). Simultaneously, a strong collaborative culture provides the social infrastructure for teamwork by establishing norms of shared responsibility, dialogue, and continuous learning (1, 9). Without such support and culture, efforts to build teamwork skills can remain superficial, failing to influence deeper instructional practice.

Technological and pedagogical innovations further highlight the importance of organizational and cultural support for teamwork. The integration of digital tools and innovative learning models, such as collaborative e-learning and artificial intelligence-assisted curricula, requires teachers to engage in joint design, experimentation, and peer feedback (14-16). For instance, collaborative e-learning environments in vocational schools have improved professional interaction among teachers and enhanced students' skill acquisition (15). Similarly, teacher design teams working to create interdisciplinary or AI-based curricula need both organizational support and a cooperative culture to manage the complexity of such tasks (2, 14). Emerging

research on virtual and hybrid teaching further indicates that collaborative learning management strategies and technology integration thrive when schools provide systemic support and nurture a climate of shared innovation (16).

In addition to advancing instructional quality, collaborative culture and teamwork also contribute to teachers' psychological well-being and professional resilience. Recent investigations into the emotional and cognitive dimensions of teaching show that supportive and collegial school climates reduce anxiety, improve coping strategies, and protect against burnout (5, 17). This is particularly significant in educational contexts where teachers face high workloads and psychological pressures; organizational support can serve as a buffer by signaling care and fairness, while collaboration provides a sense of belonging and collective efficacy (18, 19). The result is a positive cycle where teachers feel valued, engage more deeply in team-based problem-solving, and collectively drive school improvement (1).

Despite these advances, there remain important knowledge gaps regarding how organizational support and collaborative culture interact to shape teamwork skills in teachers, especially in non-Western and rapidly developing educational systems. Much of the foundational research on teacher collaboration originates from Western contexts (2, 3), whereas educational environments such as those in the Middle East face unique structural and cultural conditions that influence collaboration and support. Teacher isolation, hierarchical management practices, and limited professional autonomy are still prevalent in some settings (4). Simultaneously, policy reforms increasingly emphasize school-based professional development, data-driven decision-making, and collaborative learning communities, creating both pressure and opportunity for change (1). Understanding how perceived organizational support interacts with collaborative culture to enhance teamwork skills is crucial for informing leadership practices and teacher development initiatives in these contexts.

Furthermore, the rapid adoption of new educational paradigms, including STEAM (science, technology, engineering, arts, and mathematics) integration and interdisciplinary teaching models, underscores the urgency of effective teacher teamwork (18, 19). These approaches rely on dynamic collaboration among teachers from different subject areas and call for strong cultural and organizational enablers (3). Studies on STEAM-based methods demonstrate that fostering collaborative and creative teacher capacities enhances students' holistic skill development (19). However, implementing such methods in schools where teachers feel unsupported or disconnected from their peers is challenging and often unsustainable.

The current study addresses these gaps by examining a structural model linking perceived organizational support to teamwork skills, mediated by the collaborative culture of schools. This conceptual framework builds on evidence that organizational support directly influences teachers' professional engagement and indirectly enhances their teamwork competencies through its impact on the collective climate (1, 6, 7). By testing this model in the context of high school teachers, the research provides insight into the mechanisms that strengthen teachers' collaborative abilities and offers actionable implications for educational leaders and policymakers.

This study also contributes to the growing body of literature that seeks to move beyond descriptive accounts of teacher teamwork to more explanatory and predictive models (2, 9). By applying structural equation modeling (SEM), the research quantifies the pathways through which organizational and cultural factors shape teamwork outcomes. Such an approach allows for identifying leverage points for intervention—whether by enhancing organizational support systems, such as recognition and resource allocation, or by fostering collaborative cultural elements like trust, shared vision, and participatory decision-making (1, 3).

Finally, the study responds to calls for culturally sensitive research in teacher professional development and collaboration (4, 18). Educational systems differ widely in their organizational structures and cultural norms, meaning that strategies effective in one context may not translate seamlessly to another. By situating the analysis within a specific educational environment, this

work helps refine theoretical models and provides practical insights tailored to local realities while contributing to the global understanding of teacher collaboration and support (5, 17).

In summary, teamwork among teachers is a critical yet complex organizational capability shaped by both individual and systemic forces. Perceived organizational support and collaborative school culture represent pivotal levers for fostering such skills. The present study builds on and extends prior research by empirically examining the structural pathways connecting these constructs, offering a robust model for how schools can strengthen their collective professional performance and adaptability in increasingly complex educational environments.

Methods and Materials

Study Design and Participants

In this study, a correlational design using structural equation modeling (SEM) was applied to test the research hypotheses. The statistical population consisted of high school teachers in Qom who held degrees in educational sciences. Using a convenience sampling method, 380 teachers were selected as the sample. This sample size was determined based on recommendations for SEM analysis and to ensure sufficient statistical power to test the relationships among variables. All participants were informed about the purpose and procedures of the study before it began, and their written informed consent was obtained. Personal information and responses were kept strictly confidential, and the data were used exclusively for research purposes.

Data Collection Tools

Teamwork Skills Questionnaire: This questionnaire was developed by Jennifer Cumming and colleagues (2015) and originally contained 52 items based on conceptualizations of teamwork skills (e.g., Hobson et al., 2014; Morgan et al., 1986; Stevens & Campion, 1994). The items were either rewritten or adapted from existing instruments. Definitions of task-related and interpersonal teamwork skills were presented to two expert raters, who evaluated the alignment of each item with the definitions using a five-point scale (1 = poor alignment to 5 = excellent alignment). After receiving feedback from students and faculty members, the number of items was reduced to 46, and finally, confirmatory factor analysis (CFA) retained only 10 items for the analysis. Respondents rated each item on a five-point Likert scale (1 = never to 5 = always). In the present study, the reliability coefficient (Cronbach's alpha) for this questionnaire was calculated as 0.81.

Perceived Organizational Support Scale (POSS): This instrument consists of 8 items with six response options ranging from "strongly disagree" to "strongly agree." The developers have reported adequate validity and reliability for this scale (Rhoades & Eisenberger, 2002). In the current study, the Cronbach's alpha coefficient for this scale was 0.78, indicating satisfactory internal consistency and reliability.

School Collaborative Culture Questionnaire (LCCI 4.0): The teacher version of LCCI 4.0 was developed by Williams and colleagues (2007). This instrument includes 45 items that assess teachers' perceptions of the functioning of professional learning community (PLC) elements and reflect the overall level of collaborative culture within the school. The items are organized into eight elements: mission, vision, shared values and goals; interdependent culture based on trust; collaborative team-building; prevention and intervention systems to ensure the academic success of all students; data-driven decision-making and continuous assessment; professional development aligned with teachers' needs and career framework; principal leadership focused on student learning; and shared leadership focused on teaching and learning. The response format was an 11-point Likert scale ranging from "strongly agree" to "strongly disagree." For this study, a score ≥ 337 indicated a high level of

collaborative culture functioning, while a score ≤ 112 indicated a low level. The overall reliability coefficient of the LCCI was reported as 0.971, with reliability for each element exceeding 0.752 (Stewart, 2009). In the present study, the Cronbach's alpha for this questionnaire was calculated as 0.75.

Data Analysis

Means and standard deviations were used to describe the primary characteristics of the data. The Shapiro–Wilk test was applied to assess the normality of the data distribution. SEM was used to examine the relationships among perceived organizational support, teamwork skills, and the mediating role of school collaborative culture. Model fit indices, including χ^2/df, RMSEA, CFI, TLI, and SRMR, were calculated to evaluate the adequacy of the proposed model.

Findings and Results

To examine the descriptive characteristics of the data, the mean, standard deviation, skewness, kurtosis indices, and correlation coefficients among the variables were calculated (Table 1).

Table 1. Descriptive Statistics and Correlation Coefficients of Variables

Variable	Mean	Standard Deviation	Skewness	Kurtosis	1	2	3
1. Perceived Organizational Support	27.85	6.62	-0.32	0.21	1		
2. School Collaborative Culture	342.98	21.65	-0.28	0.15	0.45**	1	
3. Teamwork Skills	32.98	8.65	-0.21	0.12	0.51**	0.57**	1

To test the normality of the data distribution, the Shapiro–Wilk and Kolmogorov–Smirnov tests were performed. As shown in Table 2, the significance level for all variables was above 0.05; therefore, the assumption of normality was not rejected, and the use of parametric analyses such as structural equation modeling (SEM) was justified.

Table 2. Results of Normality Tests

Variable	Shapiro–Wilk (Sig)	p	Kolmogorov–Smirnov (Sig)	p
Perceived Organizational Support	0.083	0.15	0.092	0.11
School Collaborative Culture	0.105	0.17	0.111	0.15
Teamwork Skills	0.076	0.13	0.081	0.10

The structural relationship model was tested to examine the effect of perceived organizational support on teamwork skills with the mediating role of school collaborative culture. The model fit indices are presented in Table 3. As can be seen, the indices χ^2/df, RMSEA, CFI, TLI, and SRMR are all within acceptable thresholds, indicating that the model adequately fits the data.

Table 3. Fit Indices for the SEM Model

Index	Recommended Value	Study Model Value
χ^2/df	< 3	2.41
RMSEA	< 0.08	0.054
CFI	≥ 0.90	0.938
TLI	≥ 0.90	0.926
SRMR	≤ 0.08	0.045

The path coefficients are presented in Table 4. The direct path from perceived organizational support to teamwork skills was significant and positive ($\beta = 0.42$, $p < 0.01$). Likewise, the path from perceived organizational support to school collaborative culture was also positive and significant ($\beta = 0.46$, $p < 0.01$). The path from school collaborative culture to teamwork skills was significant as well ($\beta = 0.34$, $p < 0.01$). Additionally, the indirect path from perceived organizational

support to teamwork skills through school collaborative culture was significant (β = 0.12, p < 0.01), confirming the mediating role of school collaborative culture.

Table 4. Direct and Indirect Path Coefficients Among Variables

Path	Direct Path (β)	t-value	Significance	Indirect Path (β)	Significance
Perceived Organizational Support → Teamwork Skills	0.42	5.32	p < 0.01	0.12	p < 0.01
Perceived Organizational Support → School Collaborative Culture	0.46	5.87	p < 0.01	—	—
School Collaborative Culture → Teamwork Skills	0.34	4.21	p < 0.01	—	—

Overall, the model fit indices supported the validity of the SEM model, indicating a satisfactory alignment of the proposed model with the data. Path analysis confirmed that perceived organizational support not only directly enhances teamwork skills but also indirectly improves teachers' teamwork skills by fostering a stronger collaborative school culture.

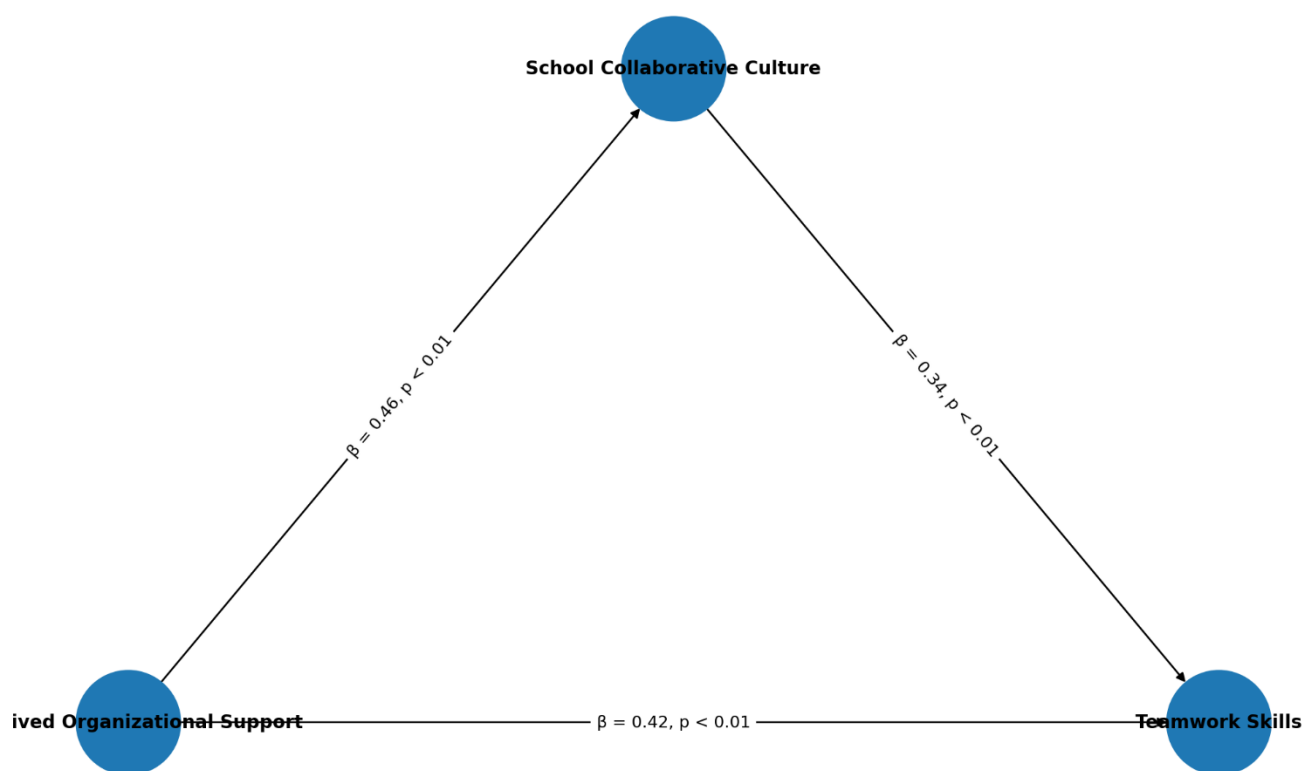Structural Model: Perceived Organizational Support, School Collaborative Culture, and Teamwork Skills

Figure 1. Final Model of the Study

Discussion and Conclusion

The present study sought to design and validate a comprehensive model for the application of the Internet of Things (IoT) in the supply chain management (SCM) of information resources within information centers. The mixed-method design allowed for a deep exploration of expert insights and robust statistical validation. Five overarching dimensions—procurement, production, distribution, information management throughout the supply chain, and relationship management throughout the supply chain—were identified and confirmed through structural modeling. The results demonstrated that the hypothesized relationships among all dimensions were statistically significant, indicating the conceptual strength and practical relevance of

the proposed model. Notably, "distribution" emerged as the highest-weighted dimension, followed by "procurement," "information management," "relationship management," and "production."

The prominence of distribution highlights the central role of timely and accurate movement of information resources in contemporary knowledge organizations. IoT-based traceability, inventory control, and real-time location monitoring address one of the most persistent challenges in libraries and archives: delays and inaccuracies in resource availability (20, 21). The finding aligns with prior studies reporting that IoT-enabled logistics improve operational visibility and reduce lead times across different industries (22, 23). In library contexts, similar technologies such as RFID and smart shelving have proven effective in optimizing circulation processes and minimizing manual errors (24, 25). By confirming distribution as the top priority, this study adds empirical evidence that IoT adoption can substantially enhance the service quality and responsiveness of information centers.

Procurement ranked second in importance, emphasizing the need for intelligent acquisition and resource planning systems. IoT-driven procurement can streamline supplier communication, automate ordering based on usage analytics, and ensure quality by integrating sensors and tracking technologies (26, 27). Previous work has shown that procurement decisions supported by IoT data reduce redundancies and mitigate risk in supply networks (28, 29). In knowledge-intensive settings, procurement complexity is heightened by the variety of formats—digital, print, multimedia—and the need to maintain up-to-date, high-demand resources (30, 31). Our results validate that integrating IoT into procurement enhances both cost efficiency and strategic alignment with user demand.

Information management throughout the supply chain emerged as a crucial, though slightly less dominant, dimension. IoT technologies generate vast amounts of data that, when properly processed, can inform decision-making, detect anomalies, and support predictive analytics (32, 33). This dimension's strong significance supports previous findings that IoT transforms traditional supply chains into data-driven ecosystems capable of real-time adaptation (23, 34). However, effective data governance and security are prerequisites. Scholars warn that IoT adoption without robust privacy and access control frameworks can expose sensitive user information (35, 36). The current model's emphasis on "support" and "addressing security challenges" within this dimension responds to these concerns, echoing recommendations for secure architecture in knowledge organizations (37, 38).

Relationship management across the supply chain, although ranked fourth, remains vital to sustained IoT adoption. Our results confirm that technological integration must be paired with strong inter-organizational collaboration and user engagement. Prior studies note that IoT success depends on building trust between suppliers, service providers, and end users, especially when data sharing and remote monitoring are involved (39, 40). The presence of components such as "technological interactions" and "better user services" reflects a user-centered approach, which aligns with research emphasizing user experience as a determinant of technology acceptance (41, 42). Libraries and information centers must not only deploy devices but also manage relationships to ensure adoption and satisfaction.

Production was found to have the least weight among the five dimensions, though it remains an important enabler of digital transformation. This dimension covers creating smart shelves, converting traditional collections into digital form, and implementing IoT-ready infrastructures for content delivery (21, 25). Its lower relative ranking may reflect the maturity of digital production processes in many information centers, where digitization and repository creation are already established (30, 31). However, the results caution against neglecting production quality, as poorly digitized or inadequately integrated resources can hinder downstream supply chain efficiency (20, 26).

The study's quantitative validation through structural equation modeling provides strong support for the model's reliability and convergent validity. The GOF and R^2 values confirm robust model fit, aligning with previous IoT-SCM frameworks that

demonstrate how multi-dimensional constructs can be operationalized (23, 29). Our findings reinforce that IoT adoption is not a single-technology intervention but a systemic transformation requiring aligned processes, governance, and infrastructure (22, 34). This systemic perspective is particularly critical for information centers where traditional workflows, such as cataloging and acquisitions, interact with digital infrastructures.

Security and privacy challenges emerged as cross-cutting concerns throughout the model. This echoes global warnings about IoT vulnerabilities, including unauthorized access, malware, and data leakage (35, 36). Libraries, as custodians of user data and intellectual property, must prioritize encryption, secure device authentication, and continuous monitoring (37, 43). The inclusion of "addressing security challenges" as a distinct component under information management indicates expert consensus on integrating risk management early in IoT planning (32, 44).

Another important implication relates to human resource capacity. The qualitative findings emphasized employee empowerment, training, and digital readiness as prerequisites for successful IoT integration. Prior literature supports this, showing that knowledge workers' attitudes and competencies influence technology uptake (42, 45). Cultural readiness and leadership support also determine the pace and sustainability of IoT-driven change (46, 47). Our model embeds these human factors in the procurement and information management dimensions, thereby offering a more holistic roadmap than purely technical frameworks.

Finally, the study extends the understanding of IoT-enabled SCM in an Iranian context, where local infrastructure, policy environment, and institutional maturity differ from Western settings (30, 38). While international research provides strong conceptual grounding, local adaptation is crucial (26, 48). By combining global best practices with expert insights from Iranian information centers, this model creates a culturally and operationally relevant framework that other developing nations may find adaptable (39, 49).

This research faced several limitations that should be acknowledged. First, the sample size in the quantitative phase, although statistically adequate, was limited to 152 participants from Tehran-based information centers. This may affect the generalizability of the findings to other cities and to diverse types of knowledge organizations such as corporate libraries or specialized scientific repositories. Second, the study relied on expert judgment and perceptions for qualitative coding and Delphi analysis; while carefully selected, this introduces the possibility of subjectivity and contextual bias. Third, the model was validated at a specific point in time and may require adjustments as IoT technologies and standards rapidly evolve. Additionally, budgetary and infrastructural differences across organizations could affect the applicability of the proposed framework in resource-constrained settings.

Future studies should extend this model to different organizational and cultural contexts to verify its robustness and adaptability. Cross-country comparative studies could help identify universal and context-specific factors influencing IoT adoption in information supply chains. Researchers could also explore longitudinal designs to assess how IoT maturity evolves and affects performance over time. Integrating advanced analytics such as artificial intelligence, blockchain, and edge computing into the model could offer deeper insights into emerging IoT architectures. Further investigation into user experience, including end-user trust and privacy perceptions, would provide a more human-centered understanding of IoT implementation.

Practitioners should approach IoT adoption as an integrated transformation rather than a technology upgrade. Libraries and information centers should prioritize distribution and procurement automation while maintaining strong governance over information flow and security. Investment in staff training and empowerment is crucial to ensure cultural readiness and technical competence. Managers should foster collaborative relationships across supply chain partners and embrace

interoperable platforms that can scale with technological advances. Strategic alignment of IoT initiatives with organizational missions and user expectations will maximize the benefits of digital transformation in information resource management.

Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

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.

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