KMANPUB | AI and Tech in Behavioral and Social Sciences Vol. 5 No. 1 (2027): 1-13

Article history:
Received 10 April 2026
Revised 20 July 2026
Accepted 27 July 2026
Initial Publication 10 September 2026
Final Publication 01 January 2027

The Role of Digital Human Capital in the Relationship between Smart Technologies and Public Value Creation in Iran's Public Sector

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A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Hosseinpour, D., Raeesi Vanani, I., Roodsaz, H., & Karimi, A. (2027). The Role of Digital Human Capital in the Relationship between Smart Technologies and Public Value Creation in Iran's Public Sector. *AI and Tech in Behavioral and Social Sciences*, *5*(1), 1-13.
https://doi.org/10.61838/kman.aitech.5868

A B S T R A C T

Digital transformation has become one of the most important trends in public governance over the past decade. Governments are striving to enhance the quality of public services, transparency, and citizen satisfaction by utilizing smart technologies such as artificial intelligence, big data, the Internet of Things, and decision support systems. However, global experiences and findings in Iran indicate that the mere introduction of technology does not guarantee public value creation; rather, the success of smart government depends on the interaction between technology, digital human capital, social trust, and transformational leadership. This study aims to explain the mediating role of digital human capital in the relationship between smart technologies and public value creation, as well as to examine the moderating role of social trust and transformational leadership in this relationship. This article is based on the data, conceptual model, and findings of the dissertation "Designing a Public Value Creation Model in the Public Sector Based on Smart Technology." The results showed that smart technologies lead to public value creation only when they are embedded in the context of digital human capital, social trust, and transformational leadership.

Keywords: *Smart Technologies, Public Value Creation, Digital Human Capital, Smart Government, Social Trust, Transformational Leadership*

1. Introduction

The rapid advancement of digital technologies over the past two decades has fundamentally restructured public governance globally. Emerging technologies including artificial intelligence, big data analytics, and cloud computing have propelled governments into a new era commonly termed "smart government" within public administration literature (Scholl & Scholl, 2014). Within this paradigm, governments evolve beyond traditional administrative service delivery toward data-driven, intelligent entities pursuing enhanced service quality, institutional transparency, responsive accountability, and meaningful citizen engagement as core objectives (Davenport & Ronanki, 2018).

Central to this transformation is the concept of public value creation, which has emerged as a comprehensive metric for evaluating the effectiveness of smart government initiatives. Building on foundational scholarship, scholars argue that government success cannot be adequately assessed through narrow economic or administrative indicators alone (Moore, 1995). Rather, the capacity of

governance systems to cultivate social trust, secure political legitimacy, ensure citizen satisfaction, and advance collective welfare constitutes the primary benchmark of governmental effectiveness (Bryson et al., 2014, 2018; O'Flynn, 2007; Talbot, 2008). From this perspective, technology attains genuine significance only insofar as it enhances citizens' experiential engagement with governance and contributes meaningfully to overall quality of public life.

Despite substantial governmental investments in digital transformation projects globally, a considerable proportion of smart government initiatives have failed to achieve intended outcomes. Scholarly investigations attribute these failures to excessively technocentric approaches wherein technology is misperceived as an end in itself rather than as an instrumental means for improving public services and fostering social outcomes (Demircioglu, 2024). This perspective systematically underestimates the critical importance of human, institutional, and cultural factors in successful digital governance implementation. Empirical evidence from diverse national contexts consistently demonstrates that technology, in isolation from capable human capital, robust social trust, and visionary leadership, proves insufficient to generate sustainable public value (Lee et al., 2024).

In the Iranian context, successive governments have formulated multiple policy frameworks aimed at advancing e-government and smart government over recent years. High-level strategic documents have explicitly emphasized the necessity of integrating emerging technologies into the administrative apparatus. However, this disconnect between technological investment and substantive governance improvement underscores the inadequacy of purely technological solutions in addressing deeply entrenched institutional pathologies (Demircioglu, 2024). Research on digital innovation strategies in the public sector further confirms that many public sector organizations, despite pursuing digital transformation, predominantly focus on internal value creation activities—such as IT modernization and process optimization—rather than externally-oriented strategies that engage citizens and address broader societal needs. This suggests that even when strategic frameworks exist, they may prioritize organizational efficiency over meaningful public value creation, thereby perpetuating the gap between digital infrastructure development and tangible governance improvement.

The central challenge confronting policymakers and public administrators in Iran is that technology alone remains incapable of generating meaningful public value. The successful realization of smart government necessitates a balanced and synergistic combination of technological infrastructure, digitally competent human capital, resilient social trust, and transformative leadership (Lee et al., 2024; Moore, 1995). It is precisely this multidimensional relationship that the present study seeks to investigate. Specifically, this research aims to elucidate the mediating role of digital human capital in the nexus between smart technologies and public value creation, while simultaneously examining how social trust and transformational leadership moderate this relationship. By addressing these interconnected dynamics, the study aspires to contribute both theoretically and practically to the ongoing discourse on digital governance transformation in developing country contexts.

2. Theoretical Foundations of the Research

2.1. Evolution and Conceptualization of Smart Government

The concept of smart government has evolved significantly over the past two decades. Contemporary scholarship has established smart government as the highest level of e-government evolution, characterized by integration, openness, and the creative use of emerging technologies (Gil-Garcia et al., 2018; Scholl & Scholl, 2014).

Scholl and Scholl (2014) identify the main elements of smart government as openness and open decision-making (Scholl & Scholl, 2014), the use and sharing of open data, participation and collaboration, and improvement of government operations and services through smart technologies. These elements facilitate innovation, sustainability, competitiveness, and community livability. Similarly, Nam and Pardo (2011) emphasize that smart government requires the integration of technology, people, and institutions to achieve effective governance outcomes (Nam & Pardo, 2011).

Gil-Garcia, Dawes, and Pardo (2018) define smart government as a set of government activities that, through the creative use of emerging technologies and innovative strategies, create a more agile and flexible structure and more efficient infrastructure (Gil-Garcia et al., 2018). However, they note that there is still no clear consensus on the boundaries, components, and relationship of smart

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government with innovation and emerging technologies in the public sector.

Janssen, Charalabidis, and Zuiderwijk (2012) highlight that open data and open government initiatives are central to smart government (Janssen et al., 2012), enabling transparency, citizen participation, and collaborative value creation. They argue that the benefits of smart government extend beyond efficiency to include democratic legitimacy and social trust.

2.2. *Position of the Research Topic in Modern Public Administration Literature*

In recent decades, digital transformation has become the main driver of government redefinition and has been linked to the concept of public value creation. The government is no longer merely a service provider but plays the role of a "value facilitator." This transformation is based on interconnected theoretical perspectives:

First, Public Value Theory emphasizes legitimacy, public trust, social justice, and policy effectiveness (Moore, 1995). Moore's strategic triangle framework posits that public value is formed at the intersection of operational capacity, legitimacy, and strategic orientation. Public managers must act as public entrepreneurs who align these three elements to create sustainable public value. O'Flynn (2007) argues that the shift from new public management to public value represents a paradigmatic change in public administration, emphasizing democratic legitimacy, citizen engagement, and collective outcomes (O'Flynn, 2007). Talbot (2008) proposes a competing values approach to measuring public value, recognizing that different stakeholders may have different conceptions of what constitutes valuable public services, encompassing efficiency, effectiveness, equity, and democratic legitimacy (Talbot, 2008).

Second, Smart Governance Theory focuses on data-driven approaches, agility, systemic learning, and evidence-based decision-making (Gil-Garcia et al., 2018). This perspective emphasizes the role of technology in enabling more responsive and adaptive governance structures.

Third, theories of digital transformation highlight the importance of digital human capital, organizational capacity, and stakeholder acceptance in realizing the benefits of smart technologies. Bryson, Crosby, and Bloomberg (2014) advance public value governance as a framework that moves beyond traditional public administration and new public management, arguing that public value creation requires collaborative governance, stakeholder engagement, and attention to both process and outcomes (Bryson et al., 2014). Bryson, Crosby, and Bloomberg (2018) further elaborate on how public value and public administration intersect, emphasizing the importance of democratic governance and citizen participation (Bryson et al., 2018).

2.3. *The Role of Digital Human Capital*

Digital human capital refers to the knowledge, skills, competencies, and capabilities that enable individuals and organizations to effectively leverage digital technologies for value creation. Research demonstrates that digital competencies serve as a key mediator between technology adoption and governance outcomes. The OECD Digital Government Policy Framework emphasizes that robust governance frameworks and capacity-building initiatives are essential for driving digital transformation across government, with digital maturity characterized by the presence of robust mechanisms that enable systemic change. The framework highlights that developing capacities to integrate digital transformation into the operational infrastructure of public-sector institutions is a requirement for robust governance, and the right conditions must be established to attract, develop, and retain digital talent and skills within the public sector (Oecd, 2021).

Research on digital human resources management confirms that the effectiveness of digitalization depends on institutional context, digital skills, and stakeholder acceptance, and that digital competencies significantly enhance e-government performance and public value creation. Digital competencies serve as a key mediator between technology adoption and governance outcomes, suggesting that technology investments must be complemented by parallel investments in human capital development to realize their full potential for value creation.

2.4. *Social Trust and Transformational Leadership*

Social trust is a critical factor in the success of smart government initiatives. Research demonstrates that citizens accept government technologies when they have trust in government institutions and feel that technology is being utilized in the public interest. Studies on smart government adoption confirm that trust in government is one of the strongest factors influencing the adoption of smart government services, alongside performance expectancy and effort expectancy (Tolbert & Mossberger, 2006; Welch

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et al., 2005). Grimmelikhuijsen and Meijer (2014) provide evidence that transparency significantly affects the perceived trustworthiness of government organizations, demonstrating that transparency mechanisms, such as open data and clear communication, increase citizens' perceptions of government trustworthiness (Grimmelikhuijsen & Meijer, 2014).

Welch, Hinnant, and Moon (2005) found that citizen satisfaction with e-government services is strongly linked to trust in government (Welch et al., 2005). Tolbert and Mossberger (2006) demonstrated that e-government use can enhance trust and confidence in government when implemented effectively (Tolbert & Mossberger, 2006). These findings suggest that in the absence of social trust, even highly efficient technologies may face resistance and public non-acceptance, as citizens may perceive technological initiatives as threats to their privacy, autonomy, or democratic participation.

Transformational leadership is equally important for digital transformation success. Bass and Avolio (1994) established that transformational leaders inspire, motivate, and guide their organizations through significant change processes (Bass & Avolio, 1994). Van Wart (2013) emphasizes that public sector leaders must actively mitigate the risks and uncertainties associated with digital transformation, addressing the anxieties and disruptions accompanying technological change (Van Wart, 2013). The leadership literature emphasizes that inspiring employees is no longer enough—leaders must address the anxieties and disruptions accompanying technological change.

Wright, Moynihan, and Pandey (2012) found that transformational leadership promotes innovative behavior, job autonomy, and affective commitment, which are associated with the development of new skills and support for digital transformation initiatives (Wright et al., 2012). Their research confirms that transformational leadership significantly impacts organizational performance and mission valence in public sector contexts. Research in public sector contexts further confirms that transformational leadership significantly impacts digital transformation and sustainable development outcomes, with digital transformation mediating the connection between leadership and organizational performance.

The moderating effect of transformational leadership can be understood through the lens of change management theory, which emphasizes that successful organizational change requires not only structural and technological adjustments but also attention to the human dimensions of change including employee attitudes, beliefs, and behaviors. Leaders who exhibit transformational qualities such as idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration are better equipped to address the psychological and emotional barriers that employees may experience during digital transformation initiatives (Bass & Avolio, 1994).

2.5. Digital Transparency and Accountability

Transparency and accountability are fundamental dimensions of public value creation in smart government. Meijer (2013) argues that understanding the complex dynamics of transparency requires attention to both the availability of information and the interpretive frameworks through which citizens understand government actions (Meijer, 2013).

Piotrowski and Van Ryzin (2007) demonstrate that citizen attitudes toward transparency in local government are shaped by perceptions of government responsiveness, fairness, and effectiveness (Piotrowski & Van Ryzin, 2007). Their research shows that transparency mechanisms can enhance public trust and satisfaction when implemented appropriately. Governments which achieve a high level of digital maturity are characterized by the presence of robust digital governance mechanisms that enable them to break down silos, build institutional capacity, and lead systemic change across the public sector, fostering conditions for human-centered service design and delivery, agile policymaking, and greater accountability and trust (Oecd, 2021).

2.6. Public Value Creation Framework

The integration of smart technologies, digital human capital, social trust, and transformational leadership creates a comprehensive framework for public value creation. Kelly, Mulgan, and Muers (2002) offer an analytical framework for public service reform, identifying the dimensions of public value and the mechanisms through which it can be enhanced (Kelly et al., 2002). Their framework emphasizes that public value is created through the interaction of government, citizens, and other stakeholders.

Research confirms that governments which achieve a high level of digital maturity are characterized by the presence of robust digital governance mechanisms that enable them to break down silos, build institutional capacity, and lead systemic change across the public sector,

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fostering conditions for human-centered service design and delivery, agile policymaking, and greater accountability and trust (Oecd, 2021). The interaction between social trust and transformational leadership merits particular attention, as these two moderators may operate synergistically to amplify the positive effects of smart technologies on public value creation. When public trust is high and leadership is transformational, the organizational environment becomes more conducive to innovation, experimentation, and continuous improvement, enabling the full realization of technology's potential for value creation. Conversely, when trust is low and leadership is transactional or laissez-faire, even substantial technology investments may yield limited returns due to resistance, skepticism, and lack of engagement from both employees and citizens.

3. Methods and Materials

3.1. Research Design

This research employed a mixed-methods approach combining qualitative and quantitative phases. This methodological choice was guided by the need to both explore the contextual nuances of the phenomenon through qualitative inquiry and test the hypothesized relationships among variables in a rigorous and generalizable manner through quantitative analysis. Mixed-methods research has been widely recommended in public administration and digital government studies for its capacity to capture both the depth and breadth of complex governance phenomena (Bryson et al., 2014).

3.2. Qualitative Phase

The qualitative phase aimed to identify key dimensions, components, and contextual factors relevant to smart government implementation and public value creation in the Iranian public sector. Semi-structured interviews were conducted with a purposive sample of 18 experts in digital policy-making and public administration, selected through snowball sampling. Participants had a minimum of ten years of professional experience in public administration or digital policy, direct involvement in smart government or e-government projects, and advanced academic qualifications (Masters or Ph.D.) in relevant fields. Interviews lasted between 60 and 90 minutes and were audio-recorded with participant consent.

The collected qualitative data were analyzed using thematic analysis following the six-phase framework proposed by Braun and Clarke (2006), which included familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report (Braun & Clarke, 2006). Thematic analysis was conducted independently by two researchers to enhance trustworthiness, and disagreements were resolved through consensus discussion. The qualitative findings subsequently informed the development of the conceptual model and the design of the quantitative questionnaire.

3.3. Quantitative Phase

3.3.1. Population, Sampling, and Sample Size

The target population consisted of employees working in various public sector organizations in Iran that had implemented or were in the process of implementing smart government initiatives. A stratified random sampling strategy was employed to ensure representation across different organizational types, levels of digital maturity, and geographical regions. The sample size was determined using the guidelines proposed by Hair, Hult, Ringle, and Sarstedt (2022) for structural equation modeling, which recommend a minimum of 10 observations per indicator variable (Hair et al., 2022). With 42 indicator items across six constructs, a minimum sample of 420 respondents was required. To account for potential incomplete responses, 500 questionnaires were distributed, yielding 437 usable responses, representing a response rate of 87.4%.

3.3.2. Data Collection Instrument

A structured questionnaire was developed to measure the six research constructs: smart technologies, digital human capital, social trust, transformational leadership, digital transparency and accountability, and public value creation. All items were measured on a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The questionnaire was developed based on qualitative findings and adapted from previous validated studies (Bryson et al., 2014; Moore, 1995). Content validity was assessed through expert review, and a pilot study with 30 respondents was conducted to ensure clarity and initial reliability.

3.3.3. Data Analysis Methods

Data analysis was performed using Structural Equation Modeling (SEM) with Partial Least Squares (PLS-SEM)

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approach using SmartPLS 3 software. PLS-SEM was selected due to the exploratory nature of the research, the complexity of the model, and the non-normality of data distributions (Hair et al., 2022).

Measurement Model Assessment

The measurement model was evaluated using the following indicators:

- **Convergent Validity:** Assessed through Average Variance Extracted (AVE), with values above 0.50 indicating adequate convergent validity (Fornell & Larcker, 1981).
- **Internal Consistency Reliability:** Evaluated using Cronbach's Alpha and Composite Reliability (CR), with values above 0.70 considered acceptable (Nunnally & Bernstein, 1994).
- **Discriminant Validity:** Assessed using the Heterotrait-Monotrait Ratio (HTMT), with values below 0.85 confirming discriminant validity (Henseler et al., 2015).

Structural Model Assessment

The structural model was assessed using the following criteria:

- **Coefficient of Determination (R^2):** Indicating the proportion of variance explained in endogenous variables, with values of 0.19, 0.33, and 0.67 considered weak, moderate, and substantial, respectively (Chin, 1998).
- **Predictive Relevance (Q^2):** Calculated through the blindfolding procedure, with values greater than zero indicating adequate predictive relevance (Geisser, 1974; Stone, 1974).
- **Standardized Root Mean Square Residual (SRMR):** Used to assess overall model fit, with values below 0.08 indicating acceptable fit (Hu & Bentler, 1999).
- **Path Coefficients and Significance Levels:** Standardized path coefficients (β) and t-values were computed, with t-values exceeding 1.96 ($p < 0.05$) and 2.58 ($p < 0.01$) considered significant.

Mediation and Moderation Testing

- **Mediation Analysis:** The mediating role of digital human capital was tested using the bootstrapping method with 5,000 resamples. The significance of the indirect effect was assessed through the 95% bootstrap confidence interval; if the interval did not include zero, the indirect effect was considered significant (Preacher & Hayes, 2008)

Moderation Analysis: The moderating effects of social trust and transformational leadership were tested by creating interaction terms in the structural model. Variables were standardized before creating product terms, and significance was assessed using bootstrapping (Aiken & West, 1991).

4. Findings and Results

4.1. Descriptive Statistics of Research Variables

Descriptive statistics including means and standard deviations were calculated for all six research variables. As presented in Table 1, the mean scores ranged from 3.32 to 3.81 on a 5-point Likert scale. As shown in Table 1, the highest mean score among the research variables belongs to Public Value Creation (M = 3.81, SD = 0.63), indicating that respondents perceive a relatively high level of public value creation in their organizations. The lowest mean score is associated with Social Trust (M = 3.32, SD = 0.74), suggesting that citizen trust in government institutions remains a concern within the Iranian public sector context. The standard deviations for all variables range from 0.63 to 0.74, indicating acceptable dispersion around the mean scores. Notably, Digital Transparency and Accountability (M = 3.76, SD = 0.65) and Transformational Leadership (M = 3.71, SD = 0.67) also demonstrate relatively high mean scores, while Smart Technologies (M = 3.64, SD = 0.71) and Digital Human Capital (M = 3.58, SD = 0.69) show moderate levels.

Table 1

Descriptive Statistics of Research Variables

Variable	Mean	Standard Deviation
Smart Technologies	3.64	0.71
Digital Human Capital	3.58	0.69
Social Trust	3.32	0.74
Transformational Leadership	3.71	0.67
Digital Transparency and Accountability	3.76	0.65

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Public Value Creation	3.81	0.63

4.2. *Correlation Matrix*

To examine the bivariate relationships among the research variables, Pearson correlation coefficients were calculated. Table 2 presents the complete correlation matrix for all six variables. As displayed in Table 2, all correlation coefficients are positive and statistically significant ($p < 0.01$), indicating meaningful relationships among the research variables. The strongest correlation is observed between Smart Technologies and Digital Human Capital ($r = 0.61$), suggesting that organizations with more advanced smart technology infrastructure tend to possess higher levels of digital human capital. The correlation between Smart Technologies and Public Value Creation ($r = 0.52$) is also substantial, indicating a positive relationship between technology adoption and value creation outcomes. Additionally, Digital Human Capital shows a moderate correlation with Public Value Creation ($r = 0.45$), while Social Trust exhibits the weakest correlation with Smart Technologies ($r = 0.32$). These preliminary correlations provide initial support for the hypothesized relationships and justify further multivariate analysis.

Table 2

Correlation Matrix of Research Variables

Variable	1	2	3	4	5	6
1. Smart Technologies	1					
2. Digital Human Capital	0.61	1				
3. Social Trust	0.32	0.36	1			
4. Transformational Leadership	0.40	0.44	0.41	1		
5. Digital Transparency	0.46	0.48	0.43	0.47	1	
6. Public Value Creation	0.52	0.45	0.38	0.41	0.48	1

4.3. *Hierarchical Regression Analysis*

To examine the incremental contribution of each variable block in explaining public value creation, hierarchical regression analysis was conducted. Four models were estimated, with control variables entered first, followed by the successive addition of predictor variables. Table 3 presents the results of this analysis. As shown in Table 3, Model 1 with only control variables explains approximately 6% of the variance in public value creation ($R^2 = 0.06$). The inclusion of Smart Technologies in Model 2 substantially increases the explained variance to 29% ($\Delta R^2 = 0.23$), confirming that technology adoption is a significant predictor of public value creation. In Model 3, the addition of Digital Human Capital further increases R^2 to 42% ($\Delta R^2 = 0.13$), indicating that human capital development contributes uniquely to value creation beyond the effects of technology alone. Finally, Model 4 incorporates Social Trust and Transformational Leadership, raising the total explained variance to 49% ($\Delta R^2 = 0.07$). This incremental pattern demonstrates that each variable block contributes significantly to explaining public value creation, with the full model accounting for nearly half of the variance in the dependent variable. The substantial change in R^2 from Model 1 to Model 2 (0.23) underscores the critical role of smart technologies, while the continued improvements in Model 3 and Model 4 highlight the importance of human capital, trust, and leadership in facilitating value creation.

Table 3

Hierarchical Regression Results

Model	Variables Entered	R^2	Change in R^2
Model 1	Control Variables	0.06	—
Model 2	Smart Technologies	0.29	0.23
Model 3	Digital Human Capital	0.42	0.13

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Model 4	Social Trust and Transformational Leadership	0.49	0.07

4.4. *Mediation Analysis: Digital Human Capital*

To test the mediating role of digital human capital in the relationship between smart technologies and public value creation, bootstrapping analysis was performed using SmartPLS. The indirect effect was examined through the product of the path coefficients from smart technologies to digital human capital and from digital human capital to public value creation. Table 4 presents the mediation test results. As presented in Table 4, the path coefficient from Smart Technologies to Digital Human Capital is 0.61 with a t-value of 8.73, which exceeds the critical threshold of 1.96 at the 95% confidence level, confirming a strong and significant positive relationship. Similarly, the path coefficient from Digital Human Capital to Public Value Creation is 0.33 with a t-value of 5.41, also demonstrating statistical significance. The indirect effect of smart technologies on public value creation through digital human capital is 0.20. To determine the significance of this indirect effect, bootstrapping with 5,000 resamples was conducted. The 95% bootstrap confidence interval ranges from 0.14 to 0.27 and does not include zero, confirming that the indirect effect is statistically significant. These findings provide strong evidence that digital human capital partially mediates the relationship between smart technologies and public value creation. In other words, the positive effect of smart technologies on public value creation is partially explained by their contribution to developing and enhancing digital human capital within public sector organizations.

Table 4

Mediation Test of Digital Human Capital

Path	Path Coefficient	t-value	Result
Smart Technology → Digital Human Capital	0.61	8.73	Significant
Digital Human Capital → Public Value Creation	0.33	5.41	Significant
Indirect Effect	0.20	—	Confirmed
Bootstrap Confidence Interval	0.14 – 0.27	—	Significant

4.5. *Moderation Analysis*

To examine the moderating effects of social trust and transformational leadership on the relationship between smart technologies and public value creation, interaction terms were created and analyzed within the structural equation model. Table 5 presents the results of the moderation analysis. As shown in Table 5, both social trust and transformational leadership demonstrate significant moderating effects on the relationship between smart technologies and public value creation. The interaction effect of Social Trust has a coefficient of 0.21 with a t-value of 3.64, exceeding the 1.96 critical value, indicating that social trust significantly strengthens the positive relationship between smart technologies and public value creation. Similarly, the interaction effect of Transformational Leadership yields a coefficient of 0.18 with a t-value of 3.11, also statistically significant. These findings indicate that the relationship between smart technologies and public value creation is not uniform across all organizational contexts. Rather, this relationship is significantly enhanced when levels of social trust are higher and when transformational leadership styles are more prevalent within public sector organizations. Organizations characterized by higher social trust and stronger transformational leadership demonstrate more pronounced positive effects of smart technology adoption on public value creation compared to organizations with lower levels of these moderating factors.

Table 5

Moderation Effects

Moderator Variable	Effect Coefficient	t-value	Result
Social Trust	0.21	3.64	Significant

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Transformational Leadership	0.18	3.11	Significant

4.6. *Measurement Model Assessment: Validity and Reliability*

To ensure the quality and rigor of the measurement model, multiple validity and reliability indicators were assessed following established guidelines in the literature. Table 6 presents a summary of these assessment results. As presented in Table 6, all constructs demonstrate satisfactory internal consistency reliability, with Cronbach's Alpha values ranging from 0.82 to 0.91, all exceeding the recommended threshold of 0.70. Similarly, Composite Reliability (CR) values range from 0.84 to 0.93, surpassing the acceptable cutoff of 0.70 and confirming the reliability of the measurement scales. Regarding convergent validity, the Average Variance Extracted (AVE) values range from 0.52 to 0.68, all exceeding the minimum recommended value of 0.50, indicating that each construct explains more than half of the variance in its indicators. For discriminant validity assessment, the Heterotrait-Monotrait Ratio (HTMT) values are all below 0.85, confirming that the constructs are empirically distinct from one another. Additionally, the Standardized Root Mean Square Residual (SRMR) value is 0.061, which is below the recommended threshold of 0.08, indicating acceptable model fit. Collectively, these results confirm that the measurement model demonstrates adequate reliability, convergent validity, discriminant validity, and overall model fit, thereby providing a solid foundation for interpreting the structural relationships among the research variables.

Table 6

Validity and Reliability Indicators of the Measurement Model

Indicator	Value	Status
Cronbach's Alpha	0.82 – 0.91	Favorable
Composite Reliability (CR)	0.84 – 0.93	Favorable
Average Variance Extracted (AVE)	0.52 – 0.68	Favorable
HTMT	< 0.85	Confirmed
SRMR	0.061	Acceptable

5. Discussion

The findings of the present research demonstrate that smart technologies have a positive and significant effect on public value creation; however, this effect is primarily strengthened through the pathway of digital human capital. These results indicate that technology alone is incapable of creating public value, and the success of smart government is fundamentally dependent on human and organizational capacity. This finding aligns closely with Moore's (1995) strategic triangle framework, which posits that public value is formed at the intersection of operational capacity, legitimacy, and strategic orientation—not in tools or technologies themselves, but in the government's ability to respond effectively to societal needs and expectations (Moore, 1995). Furthermore, the results of this research are consistent with the studies of Bryson, Crosby, and Bloomberg (2014) and Bryson, Crosby, and Bloomberg (2018), as these works explicitly assert that smart government achieves success when technology serves to improve public welfare, enhance transparency, and elevate social trust (Bryson et al., 2014, 2018). As the OECD Digital Government Policy Framework emphasizes, robust governance frameworks and capacity-building initiatives are essential for driving digital transformation across government, with digital maturity characterized by the presence of robust mechanisms that enable systemic change (Oecd, 2021).

The mediation analysis results revealed that digital human capital plays a significant mediating role in the relationship between smart technologies and public value creation. This finding carries considerable practical importance because many digital transformation programs in Iran have predominantly focused on infrastructure development while neglecting human resource training, digital skills enhancement, and organizational culture change. The OECD highlights that developing capacities to integrate digital transformation into the operational infrastructure of public-sector institutions is a requirement for robust governance, and the right conditions must be established to attract, develop, and retain digital talent and skills within the public sector (Oecd, 2021). In such circumstances, even the most advanced smart systems cannot lead to genuine improvement in public services

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E-ISSN: 3041-9433

because employees lack the necessary competencies to leverage these technologies effectively, and organizational cultures remain resistant to the changes that technology enables. The mediation finding thus provides empirical evidence for the argument that technology investments must be complemented by parallel investments in human capital development to realize their full potential for value creation. Research confirms that the effectiveness of digitalization depends on institutional context, digital skills, and stakeholder acceptance, and that digital competencies serve as a key mediator between technology adoption and governance outcomes.

The research results also demonstrated that social trust and transformational leadership have significant moderating roles in the relationship between smart technologies and public value creation. This indicates that citizens accept government technologies when they have trust in government institutions and feel that technology is being utilized in the public interest rather than for surveillance, control, or bureaucratic convenience. Studies on smart government adoption confirm that trust in government is one of the strongest factors influencing the adoption of smart government services, alongside performance expectancy and effort expectancy (Tolbert & Mossberger, 2006; Welch et al., 2005). These findings suggest that in the absence of social trust, even highly efficient technologies may face resistance and public non-acceptance, as citizens may perceive technological initiatives as threats to their privacy, autonomy, or democratic participation. Research on e-government adoption further demonstrates that strong relational bonds and high relationship quality significantly enhance e-government adoption and promote proactive citizenship behaviors (Grimmelikhuijsen & Meijer, 2014).

Similarly, the effect of transformational leadership demonstrates that digital transformation is not merely a technological change but fundamentally a cultural and managerial transformation that requires leaders to inspire, motivate, and guide their organizations through significant change processes. The moderating effect of transformational leadership on digital transformation has been established in public sector research, with studies showing that transformational leadership promotes innovative behavior, job autonomy, and affective commitment, which are associated with the development of new skills and support for management (Bass & Avolio, 1994; Van Wart, 2013). Research in public sector contexts further confirms that transformational leadership significantly impacts digital transformation and sustainable development outcomes, with digital transformation mediating the connection between leadership and organizational performance (Wright et al., 2012). Transformational leaders, by creating motivation, supporting innovation, and reducing employee resistance, provide the context for technology acceptance and organizational learning to flourish. Leaders who promote continuous learning help their people close the skills gap, boosting the organization's ability to respond to rapid technical advances.

The moderating effect of transformational leadership can be understood through the lens of change management theory, which emphasizes that successful organizational change requires not only structural and technological adjustments but also attention to the human dimensions of change including employee attitudes, beliefs, and behaviors. Leaders who exhibit transformational qualities such as idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration are better equipped to address the psychological and emotional barriers that employees may experience during digital transformation initiatives (Bass & Avolio, 1994). By fostering a shared vision, encouraging experimentation and learning, and providing support and recognition, transformational leaders can mitigate the anxieties and uncertainties that often accompany technological change, thereby facilitating smoother adoption and implementation of smart technologies. The leadership literature emphasizes that leaders must actively mitigate the risks and uncertainties associated with digital transformation; inspiring employees is no longer enough—leaders must address the anxieties and disruptions accompanying technological change (Van Wart, 2013).

The interaction between social trust and transformational leadership merits particular attention, as these two moderators may operate synergistically to amplify the positive effects of smart technologies on public value creation. When public trust is high and leadership is transformational, the organizational environment becomes more conducive to innovation, experimentation, and continuous improvement, enabling the full realization of technology's potential for value creation. Conversely, when trust is low and leadership is transactional or laissez-faire, even substantial technology investments may yield limited returns due to resistance, skepticism, and lack of engagement from both employees and citizens. Research confirms that governments which achieve a high level of

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E-ISSN: 3041-9433

digital maturity are characterized by the presence of robust digital governance mechanisms that enable them to break down silos, build institutional capacity, and lead systemic change across the public sector, fostering conditions for human-centered service design and delivery, agile policymaking, and greater accountability and trust (Oecd, 2021). This synergistic relationship underscores the importance of adopting a holistic approach to digital transformation that simultaneously addresses multiple dimensions of the organizational and institutional context rather than focusing narrowly on technological implementation.

The results of this research indicate that public value creation in the smart government era is the result of interaction among technology, people, and institutions, with no single factor being sufficient in isolation. This finding has important implications for policy and practice, suggesting that any policy-making in the field of digital transformation should adopt a comprehensive and multidimensional approach, simultaneously attending to technological infrastructure, human capital development, public trust strengthening, and organizational leadership reform. The OECD framework on digital talent and skills emphasizes that governments must establish conditions to attract, develop, and retain digital talent, and that developing digital competencies is essential for successful transformation (Oecd, 2021). Policymakers and public managers should recognize that investments in smart technologies should be accompanied by proportional investments in training and development programs that enhance digital literacy and technical competencies among public sector employees, as well as initiatives that build and maintain public trust through transparency, accountability, and citizen engagement (Meijer, 2013; Piotrowski & Van Ryzin, 2007). Moreover, leadership development programs should be designed to cultivate transformational leadership qualities among public sector managers, equipping them with the skills and mindsets necessary to guide their organizations through the complex and often challenging process of digital transformation (Bass & Avolio, 1994; Van Wart, 2013; Wright et al., 2012)

6. Conclusion

This research investigated the mediating role of digital human capital in the relationship between smart technologies and public value creation, as well as the moderating effects of social trust and transformational leadership within the Iranian public sector context. The findings provide robust empirical evidence that smart technologies contribute to public value creation primarily through the development and enhancement of digital human capital, while social trust and transformational leadership significantly strengthen this relationship. Technology alone, without corresponding investments in human competencies, organizational capacity, and institutional trust, proves insufficient to generate sustainable public value. The results demonstrate that public value creation in the smart government era is the product of interaction among technology, people, and institutions, with no single factor being sufficient in isolation. For policymakers and public administrators, this implies that digital transformation strategies must adopt a holistic approach that simultaneously addresses technological infrastructure, human capital development through comprehensive training programs, public trust building through transparency and accountability mechanisms, and leadership capacity development to cultivate transformational qualities among managers. While the cross-sectional design and focus on the Iranian context limit generalizability, the findings contribute theoretically to extending public value and smart governance frameworks and offer practical guidance for developing countries pursuing digital government transformation. Future research should employ longitudinal designs to examine dynamic relationships over time and conduct comparative studies across diverse national contexts to enhance understanding of contextual influences on these critical relationships.

Authors' Contributions

All authors equally contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We would like to express our gratitude to all individuals helped us to do the project.

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AI and Tech in Behavioral and Social Sciences
E-ISSN: 3041-9433

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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