http://dx.doi.org/10.18623/rvd.v23.5810

EXAMINING THE IMPACT OF DIGITAL LEADERSHIP ROLES ON INNOVATION CAPABILITIES: AN INTEGRATED MULTI-CONSTRUCT MODE

ANÁLISE DO IMPACTO DAS FUNÇÕES DE LIDERANÇA DIGITAL NAS CAPACIDADES DE INOVAÇÃO: UM MODELO INTEGRADO DE MÚLTIPLOS CONSTRUCTOS

Article received on: 12/23/2025
Article accepted on: 3/25/2026

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The authors declare that there is no conflict of interest

Abstract
The fast-paced development of online technologies has increased the demand of effective leadership that can promote innovation in an organization. This paper focuses on analyzing how digital leadership roles are impacted on organizational innovation capabilities based on an integrated multi-construct model. Digital leadership is theorized as having five different roles, which are inspirational, innovation oriented, uncertainty management, adaptation, and visionary. The research design utilized was a quantitative research design and data was gathered through a structured questionnaire of 204 C - level executives working in the digitally intensive organizations. Pearson correlation and linear regression procedures were used to test the hypotheses put forward. Based on the results all five digital leadership roles are statistically significant and have positive influence on innovation capabilities. It is worth mentioning that the visionary role turned out to be the most powerful predictor, after which there are the roles of uncertainty management and adaptation. These findings indicate that the statement of a clear digital vision is very essential in enhancing organizational innovation ability. The research contributes to the body of literature on digital leadership by showing that the role of leadership supports innovation development asymmetrically instead of in a homogenous manner. All relationships suggested were supported empirically. Offering a well-polished role-based typology, the study offers some theoretical understanding as well as practical directions to leaders who will aim to accelerate

Resumo
O rápido desenvolvimento das tecnologias online aumentou a demanda por uma liderança eficaz, capaz de promover a inovação nas organizações. Este artigo se concentra na análise de como as funções da liderança digital influenciam as capacidades de inovação organizacional, com base em um modelo integrado de múltiplos constructos. A liderança digital é teorizada como tendo cinco funções diferentes: inspiradora, orientada para a inovação, gestão da incerteza, adaptação e visionária. O desenho de pesquisa utilizado foi quantitativo, e os dados foram coletados por meio de um questionário estruturado aplicado a 204 executivos de nível C que trabalham em organizações com intensa presença digital. Foram utilizados procedimentos de correlação de Pearson e regressão linear para testar as hipóteses apresentadas. Com base nos resultados, todas as cinco funções de liderança digital são estatisticamente significativas e exercem influência positiva sobre as capacidades de inovação. Vale ressaltar que o papel visionário revelou-se o preditor mais poderoso, seguido pelos papéis de gestão da incerteza e adaptação. Essas descobertas indicam que a definição de uma visão digital clara é essencial para aprimorar a capacidade de inovação organizacional. A pesquisa contribui para o corpo de literatura sobre liderança digital ao mostrar que o papel da liderança apoia o desenvolvimento da inovação de forma assimétrica, em vez de homogênea. Todas as relações sugeridas foram comprovadas empiricamente. Ao apresentar uma tipologia baseada em funções bem elaborada, o estudo oferece tanto uma

the level of innovation performance in dynamic digital settings.

Keywords: Digital Leadership. Innovation Capabilities. Digital Transformation. Leadership Roles. Organizational Innovation.

compreensão teórica quanto orientações práticas para líderes que buscam acelerar o nível de desempenho em inovação em ambientes digitais dinâmicos.

Palavras-chave: *Liderança Digital. Capacidades de Inovação. Transformação Digital. Funções de Liderança. Inovação Organizacional.*

1 INTRODUCTION

The emergence of digital tools has changed the way organizations work, compete, and innovate. Digital transformation has turned out to be a strategic requirement that has forced organizations to re-evaluate conventional organization, processes, and the style of leadership (Ul Amin & Khan, 2024). Organizations are increasingly becoming pressured to adapt to the rapid change in technology, changing customer demands and rising competition in the world, which is volatile, uncertain, complex and ambiguous. Leadership is vital in navigation organizations through the digital disruption and facilitating the creation of organizational capabilities supporting long-term competitiveness and sustained innovation. Digital leadership is one of the new paradigms in leadership that received an increasing amount of scholarly and practical interest (Santoso *et al.*, 2025). Digital leadership goes beyond the conventional forms of leadership as it incorporates vision, consciousness of technology, and proper use of digital technology to bring about changes in the organization. The digital leaders embrace new technologies, but they are also expected to motivate employees, create innovation-driven cultures, handle uncertainty, and constantly change organizational practices to changing digital conditions. Since organizations are more dependent on digital technologies to make organizations more productive and responsive, the ability to lead with digital complexity has become a determinant of organizational success (Bozkus, 2023).

One of the most essential results of successful digital leadership is innovation capabilities. Innovation capabilities can be described as the capability of an organization to constantly create, embrace, and bring into practice new ideas, processes, products, and services in response to changes in the environment. Instead of being a one-dimensional

activity, innovation capability is a multidimensional concept that involves learning, knowledge integration, experimentation, and efficient use of resources (Fatima & Masood, 2024). Companies that have high levels of innovation have a higher chance of handling uncertainty in technologies, tapping into new opportunities, and remaining relevant in the fast-moving markets. As a result, the issue of determining the leadership mechanisms that contribute to innovation capabilities has become the center of research in modern management (Brunner *et al*., 2023). The digital leadership has a positive effect on innovation-related business results, including the performance of the organization, behavioral innovation, and competitive advantage due to such mechanisms as knowledge sharing, learning orientation, and technology-based collaboration. Literature views digital leadership as a one-dimensional construct, which ignores the various functions of digital leaders in complicated organizational environments. This simplification restricts the clarity of theory and the ability to reflect the complexity of leadership practices that are necessary to bring about innovation in digitally intensive situations (Shahzad, 2024).

Empirical data on digital leadership-innovation relationship have been left in fragments and have been situation-specific. Such technological uncertainty as technological is especially problematic for the organization determined to convert digital initiatives into substantial innovation results. Leaders must deal with ambiguous situations, mitigate the resistance to change, and offer strategic direction in cases when it is unclear where the technological paths will take them (Rimita *et al*., 2020). The role of leadership in dealing with uncertainty as an innovation capabilities factor has not been fully researched despite its significance. The modern digital leaders must execute several interconnected functions, which are inspiring employees, enabling innovation, dealing with uncertainty, building flexibility, and expressing a clear digital vision. These functions are usually considered on an individual basis and not in an integrated approach. The current research paper suggest an integrated multi-construct model to determine how five different digital leadership roles: Inspirational Role, Innovation Role, Uncertainty Management Role, Adaptation Role, and Visionary Role, contribute to organizational innovation capabilities (Nabi *et al*., 2023). This work provides a more detailed comprehension of the development of innovation capability through distinct leadership behavior by taking a role-based approach.

2 CONCEPTUAL BACKGROUND

2.1 Digital leadership and innovation capabilities

The increased complexity of digital environment has made digital leadership a vital organizational competency and no longer a managerial skill. Digital leadership means that leaders can effectively use digital technologies, data, and platforms in a strategic way and at the same time assist employees to navigate through the constant technological change (Chatterjee *et al*., 2023). In contrast to the traditional leadership styles that imply stability and hierarchical control, digital leadership is dynamic, presupposing technological awareness, responsiveness, and the combination of digital tools with organizational processes and strategy. In a highly digital and uncertain environment, the effectiveness of leaders is highly related to innovation-based results. Innovation capabilities can also be described as the capability of an organization to create, embrace, and implement new ideas, technologies, and processes that add value (Razzak *et al*., 2025). These are not isolated innovation capabilities but learning capabilities, knowledge integration capabilities, experimentation capabilities and continuous improvement capabilities.

Digital leadership is positively associated with innovation outcomes. Digital leaders are more innovative as they encourage the adoption of new technologies, interdisciplinary work, and cultures that facilitate exploration and learning (Kawiana, 2023). Empirical evidence also indicates that those leadership practices that match digital transformation contribute to creativity, innovativeness and successful utilization of the digital resources. Nevertheless, the consideration of digital leadership as one factor simplifies its impact on innovation. It is a complicated relationship, which is influenced by several leadership actions that are concurrent in the digital environments. Thus, it is necessary to be more analytical in discerning the value of individual leadership roles that play an important role in achieving innovation potential. Out of this void, this paper uses a role-based approach to digital leadership to explore how the specified leadership functions influence the organizational innovation potential in a digitally dynamic setting (Croitoru *et al*., 2023).

2.2 Role-based perspective of digital leadership

Most of the literature on digital leadership conceptualizes the concept as unidimensional and therefore believes that there are consistent leadership behaviors across context and outcomes, which is simplistic to the complexity of leadership in digital contexts. In practice, digital leadership comprises of interrelated positions that change depending on the demands of the organization, the environmental factors, and the strategic focus. Role-based approach can provide a more subtle insight into the impact that various leadership practices have on organizational performance (Chang *et al*., 2021). These roles are especially relevant in digital settings, as the technological change is often very dynamic, and digital transformation efforts are characterized by uncertainty (Bindel Sibassaha *et al*., 2025). Strategic focus and flexibility are essential in the long-term management of technology because it entails dealing with uncertainty. Conceptualization Role-based causes greater clarity of theory and a superior foundation of empirical analysis to emerge (Zia *et al*., 2025). This research contributes directly to the categorization of five roles of digital leadership that will be specifically determined to have an impact on the innovation ability of organizations..

2.3 Key roles of digital leadership

The core of digital leadership is a group of complementary roles that have overall effects on the creation of innovative potential and its maintenance in organizations. One of these is the inspirational quality of digital leadership that is necessary to stimulate employees to participate in digital initiatives and innovation activities. Inspirational leaders play a pivotal role in reducing resistance to change by cultivating intrinsic motivation, strengthening commitment, and reinforcing individuals' confidence in their own capabilities. Through this process, they create a supportive psychological climate that encourages proactive engagement in creative problem-solving and adaptive behaviors (Türk, 2023). This kind of motivation is especially needed in online environments, where risk-taking and learning may need to be a daily occurrence.

Digital leadership innovation role is concerned with the direct provision of innovation-related operations in the organization. Leaders who fulfill this role facilitate experimentation, encourage knowledge sharing, and allocate funds towards any innovation efforts. Innovation capabilities rely on organizational systems which are reinforced by leaders (Shafizadeh, 2024).

Digital leadership is vital in the uncertainty management of highly technological and ambiguous settings. Throughout the process of digital transformation, competent leaders minimize confusion, alleviate among employees, and stay focused in the organization despite the high pace of technological change and market needs.

Digital leadership is also characterized by the adaptation role, which makes it flexible, learns, and responsive (Krauter, 2019). Leaders' ought to achieve flexibility to make sure that innovation programs are always in touch with the evolving technological and market trends.

Lastly, the visionary component of digital leadership is the ability to build a clear and digital future for the organization. Innovation initiatives should align with long-term strategic objectives, and visionary leaders should communicate how digital transformation can help the organization achieve purpose and sustainability. It is a prospective outlook that guides the activities of innovations and guarantees the consistency of the short-term experimentation and long-term capability building (O'Connor *et al*., 2022). These five roles create a balanced leadership model that empowers digital leaders to make a difference in the innovation potential of organizations.

2.4 Theoretical foundations of the study

The theoretical foundations of this paper are mainly based on the Resource-Based View (RBV) and Dynamic Capabilities View (DCV). According to the RBV, organizational resources and capabilities are regarded as the sources of the sustained competitive advantage (Shahi, 2024). Innovation capabilities are thought of as strategic capabilities that help organizations to generate value through the process of constant innovation. The RBV does not entirely describe how organizations accommodate these capabilities in volatile environments. The DCV expands this reasoning by highlighting the importance of managerial and leadership interventions in seizing opportunities,

capturing resources, and changing the organizational capabilities. The role of digital leadership can be seen as the enabling mechanism via which organizations construct and reorganize their innovation capabilities due to technological change (Kero & Bogale, 2023). Through a combination of these theoretical backgrounds, digital leadership roles are placed as critical determiners of innovation capabilities in the dynamic digital environment of this research, offering a solid theoretical ground for the proposed research model.

3 HYPOTHESES DEVELOPMENT

Digital leadership with digitally intensive settings is characterized by several roles, which influence organizational behaviour, learning and strategy. Innovation processes require leadership that would promote motivation, experimentation, adaptability, and long-term orientation. On such a role-based view, the subsequent hypotheses test the impact of specific digital leadership functions on the innovation abilities.

3.1 Inspirational role of digital leadership and innovation capabilities

Digital leadership takes significantly inspirational positioning in motivating employees to accept the digital transformation and be active participants in the innovation activities. The given leadership contributes to lessening resistance to change in conditions of a technology uncertainty by building trust, promoting experimentation, and strengthening a vision of digital advancement. Digital leaders foster a culture of creativeness and methodical enhancement through advancing unremitting learning, sharing of knowledge, and dedication. All these dynamics combine to empower the innovativeness of the organization, as well as its ability to be flexible and compete in fast-changing digital environments.

H1: *"The Inspirational Role of digital leadership has a positive effect on innovation capabilities".*

3.2 Innovation role of digital leadership and innovation capabilities

Digital leadership innovation role directly assists the work of innovation in that it promotes experimentation, collaboration, and investing in innovation projects. Innovation oriented behaviors are promoted by leaders who allow organizations to systematize learning and idea implementation habits. These forms of leadership are known to increase the ability of the organization to generate and maintain innovations in digitally motivated environments.

H2: *"The Innovation Role of digital leadership has a positive effect on innovation capabilities".*

3.3 Uncertainty management role of digital leadership and innovation capabilities

The digital transformation may be quite ambiguous, and unexpected regarding the implications on the technological level. Digital leadership is the uncertainty managing role which introduces clarity, coherence and orientation in this case and enables organizations whose efforts relate to innovations to be sustained despite the environment uncertainty. By handling uncertainty, the leadership is able to make learning and capacity building an ongoing process thereby developing innovation capacities.

H3: *"The Uncertainty Management Role of digital leadership has a positive effect on innovation capabilities".*

3.4 Adaptation role of digital leadership and innovation capabilities

Digital leadership as an adaptation role focuses on environmental responsiveness, learning and flexibilities of the organization. Adaptive leaders seek to make organizations adapt their strategies, processes, and structures to meet changing digital needs. This lifelong learning aids in honing the current capability and creation of new ones, which ensures enhanced innovation capabilities.

H4: *"The Adaptation Role of digital leadership has a positive effect on innovation capabilities".*

3.5 Visionary role of digital leadership and innovation capabilities

Digital leadership is a visionary role that entails the articulation of a digital future and how various innovation projects are aligned to the long-term organizational objectives. Visionary leaders have the benefit of offering strategic direction that influences resource allocation and leads to coherence in short-term innovation activities and the development of long-term capabilities. This consensus enhances long-term development of innovation capabilities.

H5: *"The Visionary Role of digital leadership has a positive effect on innovation capabilities".*

4 METHODOLOGY

4.1 Research design

The study design employed in this research was cross-sectional study with quantitative research design in order to determine the role of digital leadership roles in determining the capacity of an organization to innovate. The survey-based method was chosen due to the possibility to gather the standardized information in an organized manner that will be accumulated among the organizational leaders and the latter can be evaluated statistically to verify the hypothesized relations.

4.2 Sample and data collection

The targets of the study were top-level and senior executives who are directly involved in the leadership and decision-making processes with regards to innovation. Those were "Chief Executive Officers (CEOs), Chief Operating Officers (COOs), Chief Technology Officers (CTOs), Chief Information Officer (CIOs) and Chief Digital Officer (CDOs)". Such respondents were considered appropriate because of their strategic position, and they had experience with digital leadership practices. Data collection was done using a structured questionnaire, which was distributed to the respondents through

the professional and organizational networks. 204 responses were obtained and were used in the final analysis.

4.3 Research instrument

The research used a self-administered questionnaire that was categorized into two parts. The initial part was used to provide demographic data, such as gender, age, education level, work experience, and current organizational position. The second part quantified the study variables with respect to digital role in leadership and innovation capabilities. Measurement items were all derived from established literature and modified to fit the situation of digital leadership. The scale of measurement of responses was based on a “five-point Likert scale, which ranged between 1 (strongly disagree) and 5 (strongly agree)”.

4.4 Measurement of variables

Digital leadership was defined as a multidimensional construct that included five roles. The inspirational, innovation, uncertainty management, adaptation, and visionary functions were assessed by five, six, six, five, and six items respectively, which measured leadership behaviors of motivation, creativity, uncertainty management, and adaptability as well as strategic vision.

4.5 Data analysis procedures

The data analysis involved the use of Statistical Package of the Social Sciences (SPSS). First, descriptive statistics were applied to describe the characteristics of respondents and test the composition of variables. Normality tests were done with the help of the Kolmogorov-Smirnov test. The possibility of “common method bias”, single-factor test by Harman was used. Cronbach's alpha was used to measure reliability, and all the constructs exhibited good internal consistency. The EFA was conducted to determine the construct validity, in which “Kaiser Meyer Olkin and Bartlett” tests were conducted

to support. Lastly, Pearson correlation analysis and simple linear regression analysis were used to test the hypothesized relationships between digital leadership roles and innovation capabilities. Statistical significance was assessed at the 0.05 level ($\alpha = 0.05$). Relationships with p-values below 0.05 were considered statistically significant. In this study, all regression models yielded p-values below 0.001, indicating strong statistical significance.

5 RESULTS

5.1 Demographic characteristics

This section presents the demographics of the respondents to bring contextual information on the sample profile. It is necessary to know the gender, age, educational level, job experience, and role of respondents in order to evaluate the representativeness and validity of the results connected with digital leadership and innovation capabilities.

Table 1

Demographics – Gender, Age, Education Level, Working Experience, Current Position or Role

Demographics	Frequency	Percent
Gender		
Female	34	16.7
Male	170	83.3
Total	204	100
Age		
Less than 35 years' old	28	13.7
35 to less than 45 years' old	128	62.7
45 to less than 55 years' old	40	19.6
55 and above	8	3.9
Total	204	100
Education Level		
Bachelor's Degree	119	58.3
Master's Degree	71	34.8
Doctorate Degree	14	6.9
Total	204	100
Working Experience		
5 to less than 10 years	21	10.3
10 to less than 15 years	46	22.5
15 to less than 20 years	79	38.7
20 years and above	58	28.4

Total	204	100
Current Position or Role		
CEO/GM	40	19.6
COO/CCO/CMO	103	50.5
CTO/CIO/CDO	61	29.9
Total	204	100

According to the demographic statistics, the sample size is males (83.3%), females (16.7%). Respondents in ages between 35 and less than 45 (62.7%) and ages between 45 and less than 55 (19.6%) years represent the biggest proportion of the respondents who are in the midst of their career and have a large managerial responsibility and practical role in digital transformation. A small proportion of them (3.9%) are 55 years or older, suggesting that there is little representation of executives in late-career, which can be explained by the generational connotation of embracing digital leadership functions.

On education, the sample is well educated with an average of 58.3% having Bachelor degrees, 34.8% having Master degrees and 6.9% having Doctorate degrees that is a good indicator of the capability of adhering to complex digital and innovation practices. Professional experience is also diverse because 67.1% of the respondents reported work experience of 15 years and above. In addition, the respondents are senior leaders with 50.5, 29.9 and 19.6 percent being in the COO/CMO positions, CTO/CIO/CDO positions, and CEO/GM positions respectively. This fact demonstrates that the data were collected between key decision-makers that are directly involved in the strategic, technological and innovation-driven leadership rendering the results even more authentic.

5.2 Preliminary data screening and assessment

Initial data analyses were conducted to examine the basic characteristics of the data prior to hypothesis testing. These analyses included descriptive statistics to assess central tendency, dispersion, and distributional properties of the study variables, ensuring suitability for subsequent inferential analysis.

5.2.1 Descriptive statistics of study variables

Descriptive analysis was performed to summarize respondents' perceptions of digital leadership roles and innovation capabilities in terms of mean values, variability, and distribution patterns.

Table 2

Descriptive Statistics for all Variables

Variables	N	Min	Max	Mean	Std. Deviation	Skewness	Kurtosis
INSR1	204	1	5	4.52	0.565	-1.336	5.513
INSR2	204	1	5	4.58	0.569	-1.608	6.098
INSR3	204	1	5	4.65	0.546	-1.979	8.230
INSR4	204	1	5	4.50	0.574	-1.279	5.047
INSR5	204	1	5	4.53	0.615	-1.480	4.290
INNR1	204	1	5	4.52	0.591	-1.377	4.732
INNR2	204	1	5	4.49	0.600	-1.278	4.239
INNR3	204	1	5	4.43	0.650	-1.134	2.666
INNR4	204	1	5	4.40	0.662	-1.058	2.299
INNR5	204	1	5	4.15	0.693	-0.831	2.005
INNR6	204	1	5	4.34	0.694	-1.103	2.379
UMR1	204	1	5	4.16	0.672	-1.088	3.361
UMR2	204	1	5	4.39	0.614	-1.112	4.033
UMR3	204	1	5	4.40	0.662	-1.072	2.310
UMR4	204	1	5	4.35	0.689	-1.038	2.072

UMR5	204	1	5	4.52	0.624	-1.552	4.760
UMR6	204	1	5	4.37	0.664	-1.085	2.669
AR1	204	1	5	4.30	0.661	-0.827	1.925
AR2	204	1	5	4.39	0.629	-1.003	2.903
AR3	204	1	5	4.36	0.608	-0.917	3.299
AR4	204	1	5	4.23	0.709	-1.033	2.808
AR5	204	1	5	4.38	0.673	-1.405	4.679
VR1	204	1	5	4.20	0.750	-1.046	2.297
VR2	204	1	5	4.16	0.701	-0.582	0.897
VR3	204	1	5	4.28	0.655	-0.787	1.992
VR4	204	1	5	4.25	0.711	-0.911	1.676
VR5	204	1	5	3.93	0.931	-0.445	-0.571
VR6	204	1	5	4.37	0.626	-1.072	3.598
IC1	204	1	5	4.27	0.758	-1.465	4.010
IC2	204	1	5	4.25	0.774	-1.291	2.761
IC3	204	1	5	4.17	0.724	-0.973	2.050
IC4	204	1	5	4.08	0.758	-0.885	1.466
IC5	204	1	5	4.12	0.727	-1.040	2.758

IC6	204	1	5	3.95	0.984	-0.801	0.102
IC7	204	1	5	4.09	0.764	-1.022	2.186
IC8	204	1	5	4.15	0.763	-1.070	2.284
IC9	204	1	5	4.18	0.737	-1.121	2.808
IC10	204	1	5	4.31	0.735	-1.311	3.255
IC11	204	1	5	4.24	0.646	-0.710	2.067

Note: INSR = Inspirational Role; INNR = Innovation Role; UMR = Uncertainty Management Role; AR = Adaptation Role; VR = Visionary Role; IC = Innovation Capabilities.

Based on Table 2, descriptive statistics indicated that the overall tendency was high with a range of 3.93 to 4.65 indicating that the respondents are in agreement with the digital leadership roles and innovative capabilities. The standard deviations are not that high and it is an indicator of small dispersion which implies that there is uniformity in the responses. All the items have a negative skew which indicates that the responses were concentrated on the higher end of the scale. The kurtosis values are not very high and that means that there were no dramatic deviations to normality.

5.5.2 Assessment of data normality

Normality analysis was conducted to assess the distributional properties of the measurement items prior to inferential testing.

Table 1

Test of Normality

Variables	Kolmogorov-Smirnov		
	Statistic	df	Sig.
INSR1	0.344	204	0.000
INSR2	0.374	204	0.000
INSR3	0.408	204	0.000
INSR4	0.335	204	0.000
INSR5	0.359	204	0.000
INNR1	0.346	204	0.000
INNR2	0.332	204	0.000
INNR3	0.311	204	0.000
INNR4	0.299	204	0.000
INNR5	0.293	204	0.000
INNR6	0.271	204	0.000
UMR1	0.322	204	0.000
UMR2	0.300	204	0.000
UMR3	0.302	204	0.000
UMR4	0.279	204	0.000
UMR5	0.348	204	0.000
UMR6	0.281	204	0.000
AR1	0.277	204	0.000
AR2	0.286	204	0.000
AR3	0.308	204	0.000
AR4	0.265	204	0.000
AR5	0.278	204	0.000
VR1	0.265	204	0.000
VR2	0.268	204	0.000
VR3	0.288	204	0.000
VR4	0.253	204	0.000

VR5	0.203	204	0.000
VR6	0.295	204	0.000
IC1	0.265	204	0.000
IC2	0.268	204	0.000
IC3	0.291	204	0.000
IC4	0.302	204	0.000
IC5	0.303	204	0.000
IC6	0.252	204	0.000
IC7	0.302	204	0.000
IC8	0.284	204	0.000
IC9	0.285	204	0.000
IC10	0.258	204	0.000
IC11	0.304	204	0.000

Note: INSR = Inspirational Role; INNR = Innovation Role; UMR = Uncertainty Management Role; AR = Adaptation Role; VR = Visionary Role; IC = Innovation Capabilities.

Based on the outcomes of the Kolmogorov Smirnov test, as depicted in Table 3, all items are significantly non-normal with a p-value below 0.05. This trend is typical with Likert-scaled survey data of large sample size. Since the sample size was sufficient and the parametrical measures were sound, the data was considered to be used in the further correlation and regression analyses.

5.2.3 Assessment of common method bias

To assess the potential presence of "common method bias, Harman's single-factor test" was conducted.

Table 4

"Harman's Single-Factor Test for Common Method Bias (CMB)"

Component	Initial Eigenvalue	% of Variance	Cumulative %
1	17.347	44.480	44.480
2	3.054	7.830	52.311
3	1.689	4.331	56.642
4	1.240	3.179	59.821
5	1.009	2.586	62.407

As shown in Table 4, the first factor accounts for 44.48% of the total variance, which is below the recommended threshold of 50%. This indicates that no single factor dominates the variance, suggesting that common method bias is unlikely to pose a significant concern in this study.

5.2.4 Reliability analysis

To determine the internal consistency and stability of the measurement scales that were used to measure digital leadership roles and innovation capabilities, a reliability analysis was conducted. Reliability should be established to guarantee that the items are consistently measuring what they are supposed to measure and the results obtained in the later analyses can be relied upon.

Table 5

Reliability Test

Constructs	No. of Items	Mean	Std. Deviation	Cronbach's Alpha
Inspirational Role (INSR)	5	4.56	0.474	0.883
Innovation Role (INNR)	6	4.39	0.502	0.866
Uncertainty Management Role (UMR)	6	4.36	0.483	0.832
Adaptation Role (AR)	5	4.33	0.529	0.864
Visionary Role (VR)	6	4.20	0.559	0.854
Innovation Capabilities (IC)	11	4.16	0.587	0.930

As presented Table 5, Cronbach's alpha of all constructs is greater than the suggested 0.70 indicating that all constructs are highly internally consistent. The coefficients of reliability are between 0.832 and 0.930, indicating the high measurement reliability of all digital leadership positions and innovation abilities. Also, the mean values and the low standard deviations are relatively high which indicates that the respondents have some consistent perceptions.

5.2.5 Exploratory factor analysis

The Exploratory Factor Analysis (EFA) was done in order to analyze the underlying factor structure of the measurement items as well as to determine the adequacy, reliability and validity of the constructs employed in the study. EFA is required to confirm that the observed variables are an appropriate illustration of their latent constructs before testing the hypothesis.

5.2.5.1 KMO analysis

The Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity were employed to assess sampling adequacy and the suitability of the data for factor analysis.

Table 6

KMO Test for a Sample Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.946
Bartlett's Test of Sphericity	Approx. Chi-Square	5447.923
	df	741
	Sig.	0.000

As shown in Table 6, the KMO value of 0.946 indicates excellent sampling adequacy. In addition, Bartlett's test of sphericity is significant ($p < 0.001$), confirming that the correlation matrix is suitable for factor analysis. These results demonstrate that the data are appropriate for conducting exploratory factor analysis.

5.2.5.2 Construct reliability and validity

Following confirmation of sampling adequacy, construct reliability and convergent validity were assessed using "composite reliability (CR) and average variance extracted (AVE)".

Table 7

Construct Reliability and Validity

Constructs	Components						Composite Reliability (CR)	Average Variance Extracted (AVE)
	1	2	3	4	5	6		
INSR1		0.662					0.831	0.486
INSR2		0.755						
INSR3		0.757						
INSR4		0.703						
INSR5		0.676						
INNR1						0.575	0.806	0.410
INNR2						0.592		
INNR3						0.526		
INNR4						0.545		
INNR5						0.503		
INNR6						0.549		
UMR1					0.592		0.833	0.455
UMR2					0.612			
UMR3					0.680			
UMR4					0.577			
UMR5					0.682			
UMR6					0.483			
AR1			0.584				0.780	0.418
AR2			0.524					
AR3			0.440					
AR4			0.516					
AR5			0.668					
VR1				0.436			0.812	0.430

VR2				0.510				
VR3				0.479				
VR4				0.688				
VR5				0.679				
VR6				0.535				
IC1	0.713							
IC2	0.740							
IC3	0.729							
IC4	0.749							
IC5	0.754							
IC6	0.670						0.915	0.498
IC7	0.668							
IC8	0.710							
IC9	0.705							
IC10	0.630							
IC11	0.637							

Note: INSR = Inspirational Role; INNR = Innovation Role; UMR = Uncertainty Management Role; AR = Adaptation Role; VR = Visionary Role; IC = Innovation Capabilities.

Table 7 shows that all constructs have acceptable values of composite reliability that are higher than the recommended value, thus showing strong internal consistency.

5.3 Influence of inspirational role on innovation capabilities

There were inferential statistical tests that were used to test the research hypotheses. Pearson correlation and linear regression analyses were used to determine the strength, direction, and predictive relationship of digital leadership roles with innovation capabilities empirically offering evidence about the contribution of each leadership role towards developing the organizational innovation capabilities.

H1: The Inspirational Role of digital leadership has a significant positive effect on innovation capabilities.

5.3.1 Correlation analysis

Correlation analysis was conducted to examine the strength and direction of the relationship between the inspirational role of digital leadership and innovation capabilities.

Table 8

Correlation between Inspirational Role (INSR) and Innovation Capabilities (IC)

Correlations		INSR	IC
INSR	“Pearson Correlation	1	0.508**
	Sig. (2-tailed)		0.000
	N	204	204
IC	Pearson Correlation	0.508**	1
	Sig. (2-tailed)	0.000	
	N	204	204
**. Correlation is significant at the 0.01 level (2-tailed)”.			

As Table 8 reveals, moderately and positively, there is the inspirational role of digital leadership and innovation capabilities ($r = 0.508$, $p < 0.01$). This implies that the more inspirational the leadership, the more innovative the capabilities in organizations.

5.3.2 Regression analysis

Linear regression analysis was performed to assess the predictive effect of the inspirational role of digital leadership on innovation capabilities. The ANOVA results indicate that the regression model is statistically significant ($F = 70.163$, $p < 0.001$), confirming that the inspirational role significantly explains variation in innovation capabilities.

Table 9

Influence of Inspirational Role (INSR) on Innovation Capabilities (IC)

Model Summary							
R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson			
0.508	0.258	0.254	0.50653	1.906			
ANOVA							
	Sum of Squares	df	Mean Square	F	Sig.		
Regression	18.002	1	18.002	70.163	<0.001		
Residual	51.828	202	0.257				
Total	69.829	203					
Coefficients							
	"Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics"	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.302	0.343		3.790	0.000		
INSR	0.628	0.075	0.508	8.376	0.000	1.000	1.000

Table 9 shows that the inspirational role is an important predictor of innovation capabilities ($\beta = 0.508$, $p < 0.001$), which reveals 25.8% of the variance. The results affirm H1 and they indicate the presence of positive and significant inspirational digital leadership on innovation capabilities. The results of correlation and regression show that the increased inspirational leadership is correlated with the increased organization innovation, which implies that inspirational leadership plays a substantive predictive role in influencing the outcomes of innovation in the organization.

5.4 Influence of innovation role on innovation capabilities

The relationship between the innovation role of digital leadership and organizational innovation capabilities is empirically assessed in accordance with Hypothesis H2.

H2: The Innovation Role of digital leadership has a significant positive effect on innovation capabilities.

5.4.1 Correlation analysis

Correlation analysis was performed to examine the "strength and direction of the relationship between the innovation role of digital leadership and innovation capabilities".

Table 10

Correlation between Innovation Role (INNR) and Innovation Capabilities (IC)

Correlations		INNR	IC
INNR	Pearson Correlation	1	0.586**
	Sig. (2-tailed)		0.000
	N	204	204
IC	Pearson Correlation	0.586**	1
	Sig. (2-tailed)	0.000	
	N	204	204
**. Correlation is significant at the 0.01 level (2-tailed).			

The innovation-oriented leadership and innovation capabilities have a significant association, as indicated in Table 10, since the innovation role has a strong positive correlation with innovation capabilities ($r = 0.586$, $p < 0.01$).

5.4.2 Linear regression analysis

Linear regression analysis was conducted to assess the predictive influence of the innovation role of digital leadership on innovation capabilities. The ANOVA test confirms that the regression model is statistically significant ($F = 105.80$, $p < 0.001$), indicating that the innovation role significantly predicts innovation capabilities.

Table 11

Influence of Innovation Role (INNR) on Innovation Capabilities (IC)

Model Summary							
R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson			
0.586	0.344	0.340	0.47630	1.801			
ANOVA							
	Sum of Squares	df	Mean Square	F	Sig.		
Regression	24.002	1	24.002	105.80	<0.001		
Residual	45.827	202	0.227				
Total	69.829	203					
Coefficients							
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.161	0.294		3.950	0.000		
INNR	0.684	0.067	0.586	10.286	0.000	1.000	1.000

Table 11 demonstrates that the innovation role is a significant predictor of innovation capabilities (34.4%) (β= 0.586, p = 0.001). The research results are in favor of Hypothesis H2 since innovation role of digital leadership positively and significantly impacts innovation capabilities. Results of correlation and regression demonstrate a strong predictive effect and the innovation role accounts for 34.4% of variance in organizational innovation capabilities.

5.5 Influence of uncertainty management role on innovation capabilities

The relationship between the uncertainty management role of digital leadership and organizational innovation capabilities is empirically examined in line with Hypothesis H3.

H3: “The Uncertainty Management Role of digital leadership has a significant positive effect on innovation capabilities”.

5.5.1 Correlation analysis

Correlation analysis was conducted to examine the association between the uncertainty management role and innovation capabilities.

Table 12

Correlation between Uncertainty Management Role (UMR) and Innovation Capabilities (IC)

Correlations		UMR	IC
UMR	Pearson Correlation	1	0.620**
	Sig. (2-tailed)		0.000
	N	204	204
IC	Pearson Correlation	0.620**	1
	Sig. (2-tailed)	0.000	
	N	204	204
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 12 reveals that the uncertainty management role has a strong and positive relationship with innovation capabilities ($r = 0.620$, $p < 0.01$), which means that a good leadership role in uncertainty management is highly related to an increase in organizational innovation capabilities.

5.5.2 Linear regression analysis

Linear regression analysis was performed to assess the predictive effect of the uncertainty management role on innovation capabilities. The ANOVA results demonstrate that the model is statistically significant ($F = 125.965$, $p < 0.001$), supporting the predictive strength of the uncertainty management role

Table 13

Impact of Uncertainty Management Role (UMR) on Innovation Capabilities (IC)

Model Summary							
R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson			
0.620	0.384	0.381	0.46143	1.838			
ANOVA							
	Sum of Squares	df	Mean Square	F	Sig.		
Regression	26.820	1	26.820	125.965	<0.001		
Residual	43.009	202	0.213				
Total	69.829	203					
Coefficients							
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.877	0.295		2.976	0.003		
UMR	0.753	0.067	0.620	11.223	0.000	1.000	1.000

According to Table 13, the uncertainty management role is a very predictive role in innovation capabilities ($\beta = 0.620$, $p < 0.001$), with innovation capabilities explaining 38.4 before it. This finding gives good empirical evidence for Hypothesis H3. The findings give a solid argument of H3, which argues that the uncertainty management aspect of a digital leadership role generates a significant and positive impact on innovation capabilities. The correlation and regression analysis both find that there is a strong relationship between effective uncertainty management by leaders and innovation capabilities of an organization. It is worth noting that the uncertainty management position describes 38.4 percent of the difference in the innovation capabilities, which is the most powerful predictor of the examined digital leadership roles.

5.6 Influence of adaptation role on innovation capabilities

The relationship between the adaptation role of digital leadership and organizational innovation capabilities is empirically examined in accordance with Hypothesis H4.

H4: “The Adaptation Role of digital leadership has a significant positive effect on innovation capabilities”.

5.6.1 Correlation analysis

Correlation analysis was conducted to examine the association between the adaptation role and innovation capabilities.

Table 14

Correlation between Adaptation Role (AR) and Innovation Capabilities (IC)

Correlations		AR	IC
AR	Pearson Correlation	1	0.634**
	Sig. (2-tailed)		0.000
	N	204	204
IC	Pearson Correlation	0.634**	1
	Sig.(2-tailed)	0.000	
	N	204	204
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 14 illustrates that the adaptation role is positively and significantly correlated with the innovation capabilities ($r = 0.634$, $p < 0.01$), which suggests that adaptive leadership behaviors have a close relationship with increased innovation capabilities in organizations.

5.6.2 Linear regression analysis

Linear regression analysis was performed to assess the predictive effect of the adaptation role on innovation capabilities. The regression model is statistically significant based on the ANOVA results ($F = 135.466$, $p < 0.001$), confirming the strong explanatory power of the adaptation role.

Table 15

Impact of Adaptation Role (AR) on Innovation Capabilities (IC)

Model Summary							
R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson			
0.634	0.401	0.398	0.45489	1.693			
ANOVA							
	Sum of Squares	df	Mean Square	F	Sig.		
Regression	28.031	1	28.031	135.466	<0.001		
Residual	41.798	202	0.207				
Total	69.829	203					
Coefficients							
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.120	0.263		4.254	0.000		
AR	0.703	0.060	0.634	11.639	0.000	1.000	1.000

Table 15 indicates that the innovation capabilities are highly predicted by the adaptation role ($\beta = 0.634$, $p < 0.001$) and indicates the ability to explain 40.1% of the variance. This finding provides tremendous empirical support to Hypothesis H4. The results have a high degree of support to H4, showing that the adaptation role of digital leadership can have a positive and significant impact on innovation capabilities. The correlation and regression analyses have shown that adaptive leadership behaviors are critical in improving the organizational capabilities in terms of innovation. Significantly, the adaptation role describes 40.1 percent of the variance in the innovation capabilities, which is the greatest predictive strength of all digital leadership roles that are considered.

5.7 Influence of visionary role on innovation capabilities

The relationship between the visionary role of digital leadership and organizational innovation capabilities is empirically examined in line with Hypothesis H5.

H5: The Visionary Role of digital leadership has a significant positive effect on innovation capabilities.

5.7.1 Correlation analysis

Correlation analysis was conducted to examine the association between the visionary role and innovation capabilities.

Table 16

Correlation between Visionary Role (VR) and Innovation Capabilities (IC)

Correlations		VR	IC
VR	Pearson Correlation	1	0.637**
	Sig. (2-tailed)		0.000
	N	204	204
IC	Pearson Correlation	0.637**	1
	Sig. (2-tailed)	0.000	
	N	204	204
**. Correlation is significant at the 0.01 level (2-tailed).			

As presented in Table 16, the visionary role has a high and positive relationship with innovation capabilities ($r = 0.637$, $p < 0.01$), which indicates that the visionary digital leadership is positively and significantly correlated with the greater capability of the organization to innovate. The high standardized coefficient indicates that visionary leadership plays a dominant role in shaping innovation capabilities. Leaders who articulate a clear digital future provide strategic alignment, reduce ambiguity, and ensure coherence across innovation initiatives. The substantial variance explained (40.5%) suggests that innovation capability development is strongly anchored in long-term digital direction rather than solely operational flexibility. This finding reinforces the strategic importance of vision clarity in digitally intensive environments.

5.7.2 Linear regression analysis

Linear regression analysis was performed to assess the predictive influence of the visionary role on innovation capabilities. The ANOVA findings indicate that the

regression model is statistically significant (F = 137.629, p < 0.001), reinforcing the dominant predictive influence of the visionary role.

Table 17

Impact of Visionary Role (VR) on Innovation Capabilities (IC)

Model Summary							
"R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson			
0.637	0.405	0.402	0.45344	1.705			
ANOVA							
	Sum of Squares	df	Mean Square	F	Sig.		
Regression	28.297	1	28.297	137.629	<0.001		
Residual	41.532	202	0.206				
Total	69.829	203					
Coefficients							
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF"
(Constant)	1.359	0.241		5.636	0.000		
VR	0.668	0.057	0.637	11.732	0.000	1.000	1.000

The visionary role is a major predictor of innovation capabilities (40.5%) as indicated in Table 17 (β = 0.637, p < 0.001). This observation gives a high level of empirical evidence to Hypothesis H5. The results are extremely specific to H5, which validates the claim that the visionary role of digital leadership produces a considerable positive impact on innovation capabilities. According to correlation and regression studies, visionary leadership is significant in improving the capacity to be innovative with a significant contribution of 40.5 percent, which is among the strongest predictors of digital leadership when compared with the other digital leadership dimensions under consideration. Comparative analysis of standardized beta coefficients indicates that the visionary role exerts the strongest predictive influence on innovation capabilities (β = 0.637), suggesting that strategic digital vision is the most powerful driver of innovation capability development among the examined leadership roles.

Table 18

Summary of Hypothesis Testing

Hypothesis	Relationship	β	p-value	Result
H1	INSR → IC	0.508	<0.001	Supported
H2	INNR → IC	0.586	<0.001	Supported
H3	UMR → IC	0.620	<0.001	Supported
H4	AR → IC	0.634	<0.001	Supported
H5	VR → IC	0.637	<0.001	Supported

The results indicate that all five proposed hypotheses are supported at the 0.001 significance level. Each digital leadership role demonstrates a statistically significant positive effect on innovation capabilities.

6 DISCUSSION

6.1 Overview of key findings

The main aim of the research was to investigate the effect of the discrete digital leadership functions on the organizational innovation abilities using the multi-construct framework. The results are very empirical evidence of the model provided as it suggests that all five digital leadership roles have a positive and statistically significant impact on organizational innovation capabilities.

6.2 Inspirational role and innovation capabilities

Hypothesis H1 is proven because, based on the findings, the Inspirational Role of digital leadership has a great impact on improving innovation. Leadership behaviors that drive employees, activate interest in digital programs and engage them in the program reinforce innovation processes. Employee motivation functions as a fundamental catalyst for organizational learning and innovation in digitally intensive environments characterized by experimentation and uncertainty. (Harsono *et al*., 2025). The findings

are in accordance with the existing research on leadership and are generalized to the organization capability level.

6.3 Innovation role and innovation capabilities

Hypothesis H2 was supported by the fact that the Innovation Role of digital leadership turned out to be a highly predictive predictor of innovation capabilities. The present position is a manifestation of leadership behaviors. That can directly facilitate the innovation processes, such as facilitating creativity, approving experimentation, and dedicating resources towards innovation efforts (Gui *et al*., 2024). The comparatively large variance explained by this role gives an indication that active leadership engagement in innovation activity is key in institutionalizing innovation capabilities. Such leaders increase the ability of the organization to develop and apply innovative results by promoting the spirit of collaboration and encouraging the new digital solutions (Motamedimoghadam *et al*., 2025). These results support the opinion that the power of innovation capabilities is enhanced when the leadership goes beyond the symbolic support and engages in the process of innovation-related facilitation.

6.4 Uncertainty management role and innovation capabilities

The results have also found that the Uncertainty Management Role of digital leadership is a significant contributor to innovation capabilities in favor of Hypothesis H3. Digital transformation is associated with unpredictability in terms of technological direction, application results, and competitive consequences. It may become difficult to enhance the innovation work due to anxiety and the loss of motivation in employees to participate in experiments (Patterson *et al*., 2022). Effective leaders will bring clarity, reassurance, and strategy, and therefore, there will be an environment that will underpin continued innovation. The discovered finding is valuable to the literature since it highlights the role of uncertainty management in the process of innovation capability building, which has been a less-explored field of empirical study in previous studies (Zhao, 2021).

6.5 Adaptation role and innovation capabilities

The Adaptation Role was one of the five role types of leadership that showed one of the biggest impacts on innovation abilities, which supports Hypothesis H4. The paramount role of adaptability, flexibility, and constant learning within the digital-based organizational setting. The reason is that changes in technology require organizations to keep on changing strategies, processes, and structures to stay competitive (Park & Jin, 2025). Adaptive leaders promote organizational learning through experience, reorganization, and preemptive reaction to the environment. Such leaders help organizations to optimize the current capabilities and formulate new capabilities by creating agility and responsiveness. The observed high correlation in the present study supports the perception that adaptability is the fundamental aspect of the long-term development of innovation capability, especially in rapidly changing digital contexts (Asghar *et al*., 2023).

6.6 Visionary role and innovation capabilities

Digital leadership Visionary Role was also observed to have a significant impact on the innovation capabilities to support Hypothesis H5. The leaders who are inspired to create digital futures develop a digital future, integrating the innovation efforts with long-term organizational strategies. Such a strategic orientation ensures consistency of short-term and long-term development of capabilities (Rani & Widyowati, 2021). The results indicate that the innovation capabilities are enhanced when leaders convey a common vision on which the decision-making and allocation of resources are based. Visionary leadership provides the innovative processes with a sense of purpose and direction which enables the employees to understand how their contribution to the workplace can be incorporated to the overall organizational objectives. This stance is particularly critical in ensuring that the innovation abilities are long-term rather than short-term compulsions acting in an individualistic manner (Murphy and Gouldson, 2020). Among the five examined roles, the visionary role emerged as the strongest predictor of innovation capabilities. This finding suggests that the articulation of a clear digital vision and long-

term strategic direction plays a central role in enabling organizations to develop sustained innovation capabilities. Visionary leadership ensures alignment between digital initiatives and organizational objectives, thereby reducing fragmentation and enhancing capability coherence. The prominence of the visionary role indicates that innovation capability development is not solely driven by operational flexibility or uncertainty management, but fundamentally anchored in strategic foresight and long-term digital orientation.

6.7 Integrated perspective on digital leadership and innovation capabilities

The results indicate that the innovation capabilities can be discussed as the byproduct of multiple digital leadership functions rather than single leadership behavior. Leaders enhance the outcomes of innovations through motivating employees simultaneously, simplifying innovation efforts, confronting the uncertainty, fostering flexibility, and demonstrating a coherent vision of digitalization. This mixed research offers a long-term insight on the role of digital leadership in organizational innovation (Al-Husban *et al*., 2021). The role of assuming a role-based perspective on digital leadership is especially important where there are technological turbulence and competition. The findings are valuable in enhancing the existing knowledge about the effectiveness of leadership in digital contexts to develop organizational innovation capabilities by displaying the differentiated but complementary effects of digital leadership roles.

7 THEORETICAL CONTRIBUTION

The paper has a number of significant theoretical contributions to research on digital leadership and innovation capabilities. The development of digital leadership theory involves developing the idea of digital leadership as a multidimensional, role-based construct. Although in the previous research, it is common to consider digital leadership as the same aggregated variable, this study is split into five roles. First, the study is more subtle and theoretically empirically proving that the individual roles play

an independent contribution to innovation capabilities. Second, the research adds to the literature on the capability of innovations by determining particular leadership roles as the primary antecedents of innovational capabilities. Technological, or knowledge-based drivers of innovation, but little has been done to explore leadership behaviors in a microscopic study. The present study fills this gap in that it demonstrates the influence of various leadership functions on the development of learning, experimentation, adaptability, and strategic alignment as the key elements of innovation capabilities. Third, the results expand the Dynamic Capabilities View by providing empirical evidence of how leadership roles play the role of enabling capability building. The findings indicate that digital leadership roles cannot be applied to sustain innovation in dynamic environments without sensing, seizing, and transforming. Fourth, the research fills in the gap between leadership and dynamic capability theories and provides a combined view on how managerial actions lead to organizational capabilities. Lastly, the research paper contributes to the literature on leadership by demonstrating the contrasting impacts of leadership roles in digital uncertainty.

8 MANAGERIAL IMPLICATIONS

The results of the research have several practical implications for managers and organizational leaders who are interested in improving innovation opportunities using digital leadership. Digital leadership entails a variety of complementary roles as opposed to a single leadership approach. Organizations are therefore advised to invest in leadership development programs that are inspirational, innovation-oriented, adaptive, uncertainty management, and visionary competencies. The strong influence of the Innovation Role implies that the leader is expected to become an active contributor to innovation processes and provide resources, promote experimentation, and collaboration. Managers are expected to establish formal and informal systems that authorize activities that are related to innovation and minimize the risk of failure that comes along with experimentation process. Uncertainty Management Role demonstrates that leaders should act in a transparent manner when managing technological transitions through prioritization, timely information, and support of employees to minimize ambiguity. The results indicate the significance of adaptive leadership as a force in enhancing stability and the capacity

of organizations to innovate. In addition, the Visionary Role emphasizes the necessity of leaders to be able to express explicit digital vision that will tie innovation efforts to long-term strategic goals. Explicitly telling employees of a powerful digital future can inspire, direct resource use, and provide consistency between innovative initiatives. From a managerial perspective, the dominance of the visionary role underscores the importance of articulating a coherent digital strategy. Leaders should prioritize communicating a clear digital roadmap, aligning innovation initiatives with long-term objectives, and ensuring strategic consistency across departments. Without a strong digital vision, investments in experimentation and adaptability may lack direction, limiting their contribution to sustainable innovation capability development.

9 LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study has several limitations that should be considered despite its contributions. First, the study used a cross-sectional research design, which does not allow the researcher to make inferences about causal relationships. Longitudinal designs can be utilized in future studies to understand the effects that digital leadership positions have on innovative abilities in the long term. Second, the questionnaires used to collect the data were self-reported and led to common method bias. Even though statistical analysis showed that common method bias was not a major threat, in the future, multi-source data can be used or objective measures of performance to enhance validity. Third, the research targeted high-level administration, and this could restrict the applicability of the results to other levels in the organization. The next study might be investigating the mechanism of digital leadership roles at various levels of hierarchy or with group-based teams.

10 CONCLUSION

This study examined the influence of five digital leadership roles Inspirational, Innovation, Uncertainty Management, Adaptation, and Visionary on organizational innovation capabilities using an integrated multi-construct framework. The findings reveal that all five roles have statistically significant positive effects on innovation

capabilities. Notably, the visionary role emerged as the strongest predictor, followed by uncertainty management and adaptation, underscoring the central importance of strategic digital direction in capability development. The results confirm that digital leadership is multidimensional, operating through differentiated yet complementary roles that collectively enhance an organization's ability to generate and implement innovation. The dominance of the visionary role highlights the importance of long-term digital alignment and strategic foresight in sustaining innovation performance. The study advances digital leadership theory by demonstrating the asymmetric influence of leadership roles on innovation capabilities and provides practical guidance for leaders seeking to strengthen innovation capacity in digitally intensive environments.

DECLARATION OF CONFLICTING INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

FUNDING STATEMENT

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

DATA AVAILABILITY STATEMENT

The datasets generated and analyzed during the current study are not publicly available due to confidentiality and ethical restrictions related to the participating organizations and respondents, but are available from the corresponding author upon reasonable request.

STATEMENTS AND DECLARATIONS

Consent to Participate

Not applicable.

Consent for Publication

All authors have read and approved the final manuscript and consent to its publication.

REFERENCE STYLE AND CITATIONS

The manuscript follows the journal's required reference style

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