# Human-centric digital leadership for HRM 5.0 ecosystem readiness

Oksana KRAVCHUK,
*Kyiv National Economic University named after Vadym Hetman, Kyiv, Ukraine*
*oksana.kravchuk@kneu.edu.ua*

## Abstract

Objectives: The paper examines human-centric digital leadership as a key phenomenon that shapes the development of digital competencies and the formation of organizational digital readiness within the HRM 5.0 paradigm. The study seeks to clarify the theoretical evolution of the concept and to propose an integrated interpretation that links leadership behavior, digital culture, and technological maturity. Prior work: The research builds on contemporary theories of digital transformation, human-centric leadership, and ecosystemic management. It integrates insights from frameworks such as DigComp 2.2, ESCO, and the OECD digital competence model, expanding their application through the lens of HRM 5.0, where ethical innovation, sustainability, and human-machine collaboration are central. The paper also draws on recent smart-city scholarship to situate digital leadership within broader socio-technical ecosystems that require resilience, inclusiveness, and collective intelligence. Approach: Drawing on a systematic conceptual and comparative analysis of recent academic literature (2020–2025) and monographic findings, the author develops a multidimensional framework that connects digital leadership with the readiness dimensions of organizations – strategic, cultural, technological, and competency-based. Results: Digital leadership is defined as an integrative capability combining cognitive agility, technological fluency, and ethical responsibility. It serves as a driver of digital competence development by promoting continuous learning, psychological safety, and collaborative innovation, while reinforcing organizational readiness through a shared vision, adaptive culture, and data-driven decision-making. The study positions digital leadership as a structural enabler of HRM ecosystems, including those embedded in smart-city environments, where leaders orchestrate cross-sector collaboration and support institutional resilience. Implications: The paper enhances the theoretical understanding of leadership in digital contexts and offers practical guidance for researchers and educators developing frameworks for digital upskilling and organizational change. Value: The study's originality lies in conceptualizing digital leadership as a meta-competence of HRM 5.0 – bridging individual digital skills, collective intelligence, and institutional readiness into a cohesive model that supports sustainable digital transformation.

**Keywords:** human resource management, digital HRM, digital transformation, organizational resilience, HRM ecosystem maturity

## 1. Introduction

The world of work is undergoing profound transformation driven by digital technologies, remote and hybrid work models, shifting employee expectations and the growing complexity of organisational environments. In this context, leadership is confronted with qualitatively new demands. It is no longer sufficient to manage teams through traditional hierarchical and face-to-face mechanisms; leaders must navigate digital platforms, data-driven decision-making, cyber-risks, virtual collaboration and continuous learning.

In smart city environments, these challenges are further intensified by the need to coordinate diverse stakeholders, integrate digital services across public and private sectors, and sustain community resilience in the face of crises. Digital leadership in HRM therefore becomes a critical lever for enabling smart organisations to harness

technology and human potential in ways that support resilient, inclusive and future-oriented urban communities.
Early conceptualisations of e-leadership focused primarily on the use of ICT to influence followers and coordinate work in virtual environments [1]. Over time, however, this instrumental view has become increasingly insufficient to capture the strategic and cultural roles leaders play in digital transformation. Contemporary research emphasises that digital leadership encompasses the ability to redesign business models, transform organisational culture, foster innovation and develop digital competences across the workforce [2], [3], [4], [5].

In the HRM domain, digital leadership is particularly significant. HR functions are simultaneously objects and agents of digital transformation: they introduce HR analytics, LMS/LXP platforms and AI-supported recruitment and performance systems, while also bearing responsibility for reskilling, upskilling and supporting employees through digital transition [6], [7]. Consequently, the way HR leaders interpret, embody and implement digital leadership largely determines whether digital tools become a source of sustainable competitive advantage or remain fragmented initiatives.

This paper pursues three interrelated objectives:

(1) to trace the evolution of the digital leadership concept and systematise major theoretical schools;
(2) to develop and substantiate an authorial definition of digital leadership with a focus on HRM and digital readiness;
(3) to conceptualise the mechanisms through which digital leadership shapes digital competences, organisational digital readiness and the development of HRM ecosystems.

The paper is conceptual and integrative in nature. It draws on a critical analysis of existing literature and synthesises insights into a framework linking digital leadership, digital competences and digital readiness in HRM ecosystems. In doing so, it also contributes to the broader discussion on how collective intelligence is mobilised within smart cities and public institutions, highlighting the role of human-centric digital leadership in transforming distributed knowledge, skills and experiences into coherent, community-supporting action.

## 2. Evolution of the concept of digital leadership

### *2.1. From e-leadership to strategic digital leadership*

The genesis of e-leadership is closely associated with the diffusion of ICT and the emergence of virtual teams. In its early formulation, e-leadership was defined as a process of social influence mediated by technologies such as e-mail, groupware and

videoconferencing [1], [8]. The emphasis at this stage was on how digital channels modify leader – follower communication, coordination and control mechanisms.

This initial phase may be characterised as the transformation of managerial channels. Technology was largely viewed as a neutral medium that extended existing leadership practices into virtual space. Consequently, e-leadership was conceptualised primarily through the lens of ICT adoption, digital communication and the coordination of geographically dispersed teams [1], [8].

With the acceleration of remote and hybrid work, especially after 2020, research began to highlight the cognitive and emotional dimensions of digital leadership. Scholars underscored the importance of emotional intelligence, trust, cultural sensitivity and the ability to manage virtual team dynamics under conditions of uncertainty [9], [10], [11]. Digital leaders were no longer perceived merely as technology users but as creators of psychologically safe environments and mediators of work – life boundaries in digital settings [12], [13].

In the current stage of development, digital leadership is increasingly understood as a systemic integrator and a driver of organisational change. It combines technological fluency with strategic thinking, cultural transformation and the capacity to design new business models [3], [14], [15]. Leaders act as architects of digital cultures that support experimentation, data-driven learning and collaborative problem-solving [5]. Parallel methodological advances have also generated diverse approaches to assessing digital leadership, including cognitive, behavioural and technological competence dimensions [16], [17].

More recent research introduces an additional layer – green digital leadership – which links digital transformation with sustainability and responsible innovation [18]. This perspective highlights the environmental and ethical responsibilities of leaders who guide digital change and situates digital leadership within the broader agenda of sustainable development.

Overall, the concept has evolved from technocratic, ICT-mediated management towards a human-centred, value-driven and ecologically sensitive paradigm in which digital leaders shape organisational learning, adaptability and resilience. This trajectory is particularly visible in smart city and local governance contexts, where digital leaders orchestrate technological infrastructures, citizen-facing services and inter-organisational networks that underpin resilient urban communities.

### *2.2. Theoretical schools and definitional approaches*

A review of the literature reveals several theoretical schools that conceptualise digital leadership from different analytical perspectives [1], [2], [4], [5], [18], [19].

One line of research – the technocratic approach – focuses on leaders' capacity to deploy digital technologies, manage ICT infrastructures and utilise AI tools and platforms as part of organisational processes [1], [20], [21]. This perspective views digital leadership primarily through the prism of technological competence and system optimisation.

A second group of studies adopts a communicative or virtual approach, understanding digital leadership as the effective coordination of virtual teams and management of digital communication channels [10], [19], [22]. Here, leadership effectiveness is rooted in the ability to maintain cohesion, clarity and responsiveness in digitally mediated interactions.

A third cluster foregrounds the emotional-intelligence approach, emphasising trust, emotional connection, psychological well-being and interpersonal sensitivity in digital environments [9], [12], [13]. These studies highlight that digital transformation amplifies emotional and relational demands placed on leaders, particularly in hybrid and dispersed teams.

Beyond these strands, a substantial body of work adopts an organisational-strategic approach. This school interprets digital leaders as strategic actors who align technology with organisational priorities, design transformation roadmaps and cultivate digital cultures that support innovation [3], [18], [22], [23]. Leadership is seen as a catalyst that connects digital initiatives with broader goals of adaptability, competitiveness and sustainability.

More recent scholarship proposes hybrid or integrative approaches that combine technological skills, soft competences, transformational capability and innovation-oriented behaviours [2], [4], [5], [24]. These models argue that no single dimension sufficiently explains leadership effectiveness in complex digital ecosystems.

Cognitive-psychological approaches add yet another layer by emphasising self-awareness, learning agility, metacognitive ability and the development of a digital mindset [13], [25]. These perspectives view digital leaders as reflective practitioners capable of making sense of dynamic and uncertain environments.

Cultural-contextual approaches examine how national culture, institutional dynamics, sectoral characteristics and public policy frameworks shape the expectations and practices of digital leadership [19], [26]. These studies are particularly relevant for smart city and public administration contexts, where leadership emerges at the intersection of organisational, societal and governance structures.

Taken together, these schools reflect an evolution from technology-centred accounts toward integrative perspectives that acknowledge the interplay between technology, behaviour, cognition, organisational culture and external context. A dominant tendency in recent research is the development of multidimensional models that incorporate technological competence, organisational adaptability, ethical and cultural sensitivity, and innovation-oriented leadership.

For smart cities and resilient urban communities such integrative approaches are especially significant. They underscore that effective digital leadership cannot be reduced to technical proficiency; rather, it requires the ability to mobilise collective intelligence, coordinate multi-stakeholder ecosystems and navigate socio-technical complexity in ways that support public value creation.

### *2.3. Limitations of narrow interpretations*

In many early works and popular accounts, digital leadership has been narrowly equated with the instrumental management of remote teams through communication platforms such as Zoom, MS Teams or Slack. Such a reductive view treats digital leadership as a technical function and fails to grasp its systemic role in organisational and inter-organisational transformation.

As Avolio et al. [1] emphasise, e-leadership is not merely the use of digital channels but a reconfiguration of influence mechanisms in technologically mediated environments. Cortellazzo et al. [2] similarly argue that leadership in a digitalised world requires reconceptualising the nature of authority, which increasingly depends on informational transparency, accelerated decision-making and the ability to navigate digital complexity.

The focus solely on communication tools also obscures key dimensions of digital transformation. It marginalises the role of digital culture formation, ethical and responsible use of people analytics [27], and the development of employees' digital competences that enable sustainable adaptation [5]. Furthermore, it neglects emotional intelligence, empathy and social influence, which remain foundational for cohesion and trust in virtual and hybrid settings [9].

Recent research from smart city and public governance contexts demonstrates why such narrow interpretations are particularly problematic. Schachtner and Baumann [28] show that digital transformation in municipalities depends not simply on tool adoption but on leadership-driven competence ecosystems that align technology, governance structures and cross-departmental collaboration. Likewise, Matusiak and Narożniak [29] illustrate that public trust in digital services is contingent on leaders' ability to integrate legal, technological and human-rights considerations,

underscoring that leadership effectiveness extends far beyond operational platform management.

Studies of organisational security also reinforce the risks of oversimplification. Boce [30] provides evidence that internal human-factor vulnerabilities – shaped by culture, awareness and behaviour – remain one of the most significant threats in digitally transformed organisations. These findings reaffirm that digital leadership requires not only technical proficiency but also the capacity to cultivate responsibility, resilience and secure digital practices.

The relevance of a systemic perspective is further emphasised by green and sustainability-oriented leadership models. Alabdali et al. [18] demonstrate that narrow, technocentric approaches overlook the ethical, environmental and value-based imperatives that underpin responsible digital transformation. In parallel, research on inclusive design in smart-education environments by Nistorescu [31] highlights that universal, human-centred digital environments do not emerge from tool usage alone but from leadership that prioritises accessibility, usability and equity.

Insights from innovation-oriented smart city literature further amplify the need for an expanded understanding of digital leadership. Fabrègue, Portal and Cockshaw [32] show that cities with strong human-centric leadership models are more successful in attracting and retaining highly skilled digital workers, suggesting that leadership directly shapes ecosystem competitiveness. Similarly, Necula [33] identifies that AI-enabled organisational resilience requires leaders who can orchestrate data, technologies and adaptive learning systems rather than simply manage communication platforms.

Finally, human resources development studies grounded in public administration research confirm that leadership is fundamental to governance quality. Croitoru and Bercu [34] argue that sustained investment in human resource development is a cornerstone of good governance and digital capability, further demonstrating that digital leadership encompasses institutional, cultural and developmental dimensions.

Taken together, these findings reveal that reducing digital leadership to the operational management of communication tools obscures its strategic, cultural and societal significance. A more comprehensive understanding is required – one that positions digital leadership as a platform for change, integrating vision, innovation, technological competence and human-centric values in ways that support resilient organisations and smart communities.

## 3. Authorial interpretation of human-centric digital leadership

### *3.1. Rationale for a new definition*

Despite a growing body of research, many existing definitions of digital leadership remain predominantly technocratic, emphasising the use of ICT in management processes [1], [8], [19]. Such interpretations insufficiently reflect the profound transformation of leadership practices in environments shaped by digital culture, data-driven decision-making and complex organisational dynamics [2], [18].

A first limitation concerns the underrepresentation of the cultural dimension. Empirical studies demonstrate that leaders act as primary carriers of digital culture, shaping value orientations and behavioural norms under conditions of continuous change [35]. They influence not only the implementation of technology but also the digital behaviours, attitudes and mindsets of employees. Recent findings in organisational security emphasise this point. Boce [30] shows that internal threats – stemming from employee behaviour, insufficient awareness or breaches of digital responsibility – remain among the most significant vulnerabilities in digitally transformed organisations. These results highlight that ethical, cultural and behavioural dimensions are not peripheral but foundational for effective digital leadership, since technological safeguards cannot compensate for weak trust, poor digital culture or low competence in secure digital practices.

A second limitation is the insufficient integration of the value dimension related to responsible data management, digital ethics and inclusiveness. OECD [36] and Green [27] stress that trust in digital leaders depends on transparency, adherence to ethical norms and the capacity to take socially sensitive decisions in digital contexts. Research on universal and human-centred digital design further reinforces this argument: Nistorescu [31] shows that inclusive digital ecosystems require leadership that systematically prioritises accessibility, equity and usability, rather than focusing solely on functional efficiency.

A third limitation concerns adaptiveness, which is often treated as an auxiliary characteristic. In reality, adaptiveness is structurally necessary for leadership effectiveness. Leaders must continuously respond to evolving digital tools, platforms, employee expectations and external shocks [3], [10]. Flexibility, learning orientation and readiness to experiment with new management formats are central features of digital leadership. Recent studies in AI-enabled organisational resilience confirm this trend. Necula [33] demonstrates that effective adaptation in digital ecosystems requires leaders who can orchestrate data, technologies and human learning systems in a coherent and responsive way.

Thus, existing definitions appear incomplete because they insufficiently incorporate cultural, value-based and adaptive dimensions that today largely determine

leadership effectiveness. This creates a justified need for a renewed, systemic definition that conceptualises digital leadership not only as a technical function but as a mechanism for shaping digital culture, ensuring ethical balance and enabling continuous adaptation.

In HRM ecosystems embedded in smart cities and public administrations, such a systemic understanding also entails the capacity to activate collective intelligence across departments, professions and community stakeholders. Schachtner and Baumann [28] demonstrate that municipal digital transformation succeeds when leaders mobilise interdepartmental knowledge, bridge institutional silos and cultivate shared competences. Similarly, Croitoru and Bercu [34] argue that human resource development forms a structural foundation for good governance, reinforcing the idea that digital leadership must integrate technological, organisational and societal considerations. In this context, digital leadership becomes a lever for aligning HRM practices with broader goals of urban resilience, social cohesion and inclusive, human-centric digital transformation.

### *3.2. Definition and key components*

In this paper, digital leadership is defined as an integrative capability of a leader to formulate, communicate and implement a strategic vision of digital transformation by aligning technology, organisational culture, values and adaptive human behaviour, with the aim of developing digital competencies and strengthening organisational digital readiness. In smart city and public governance settings, this integrative capability extends beyond organisational boundaries, linking HRM practices with broader ecosystem goals such as citizen well-being, inclusive participation, public trust and long-term community resilience.

This definition is grounded in five interrelated components:

- Strategic orientation. Digital leaders articulate long-term digital visions aligned with organisational and societal strategies, moving beyond operational tool management toward shaping coherent pathways for transformation. Research in public administration emphasises that strategic visioning is essential for developing human resource capabilities that underpin good governance [34].
- Technological fluency. They understand and purposefully apply digital technologies, platforms and data-driven systems as instruments for achieving human-centric and public value outcomes. As Necula [33] notes, leaders must be able to orchestrate AI-enabled systems and data ecosystems to support organisational resilience rather than merely adopt isolated tools.
- Value- and culture-orientation. Digital leaders shape digital culture based on trust, transparency, ethics, inclusiveness and responsible data use. OECD [36] and Green [27] highlight that these value foundations are prerequisites

for public trust and legitimacy in digital environments. Research on universal design further demonstrates that inclusive digital ecosystems depend on leadership that prioritises accessibility and equity [31].

- Adaptivity. They demonstrate flexibility, learning orientation, openness to experimentation and readiness to revise assumptions in response to technological evolution and societal change. Adaptivity is critical in smart city contexts where leaders must respond to dynamic citizen needs, emerging risks and complex interdependencies [28].
- Human-centric focus. Digital leaders prioritise the development of employees' digital competencies, support upskilling and reskilling and engage in coaching and mentoring. Studies show that organisational resilience and digital maturity emerge when leaders cultivate learning-oriented cultures and strengthen the human factor in digital ecosystems [30], [34].

Compared with traditional models, this approach extends the technological core by explicitly incorporating cultural, ethical and adaptive dimensions. It conceptualises digital leadership as a meta-competence that bridges individual digital skills, team-level collaboration processes and organisational or inter-organisational structures. In smart cities, this meta-competence enables leaders to mobilise collective intelligence, coordinate multi-stakeholder networks and align HRM practices with broader societal objectives, ultimately reinforcing resilient, inclusive and future-oriented urban communities.

### *3.3. Distinctions from classical models: a conceptual discussion*

Classical definitions of digital leadership provide an important foundation but remain limited when applied to complex socio-technical environments such as smart cities and digitally enabled public administrations. Avolio et al. [1] and Van Wart et al. [8] emphasise ICT-mediated influence and the adoption of digital communication tools, positioning technology as the primary vector of leadership transformation. Cortellazzo et al. [2] enrich this perspective by focusing on organisational adaptation and the redesign of work structures in digital environments, while Espina-Romero et al. [5] introduce a networked understanding of digital leadership characterised by distributed interactions and fluid authority structures.

Research in sustainability studies further extends classical models. Alabdali et al. [18] propose the notion of green digital leadership, linking technological innovation with environmental responsibility and ethical stewardship. However, despite their contributions, these models tend to foreground specific dimensions – such as technology, communication or sustainability – while underestimating the

integrative, ecosystemic and value-driven nature of digital leadership required in contemporary governance systems.

The definition proposed in this paper diverges from classical approaches in several critical respects. First, it embeds cultural, ethical and behavioural dimensions as structural, rather than supplementary, components of digital leadership. This reflects findings from organisational security [30], digital ethics [27] and public trust research [36], which demonstrate that digital transformation success depends on the integrity of cultural and value systems, not solely on technological adoption. Second, the definition expands the analytical scope by incorporating system thinking and ecosystemic interdependence. In smart city and public governance contexts, leaders must navigate cross-sector networks, align diverse institutional logics and mobilise collective intelligence across departments and community actors. This is consistent with Schachtner and Baumann [28], who argue that municipal digital transformation requires leadership capable of activating collaborative competence ecosystems rather than isolated organisational reforms.

Third, the proposed conceptualisation explicitly situates digital leadership within HRM infrastructures. It connects individual capabilities with organisational learning, knowledge management and institutional mechanisms that support digital readiness. Such integration is supported by Croitoru and Bercu [34], who show that human resource development constitutes a foundational pillar of good governance and organisational resilience.

Finally, by framing digital leadership as a meta-competence that bridges technology, culture, values and adaptive behaviour, the proposed model better reflects the complexity of digital transformation in smart communities. It captures leadership as an enabler of public value, social cohesion and long-term resilience, thereby advancing a paradigm aligned with the thematic trajectory of the SCIC conference – leading for the people and accelerating with the digital.

### *3.4. Digital HR Leader as an ecosystem orchestrator in smart and resilient communities*

In the HRM domain, a digital leader is conceptualised as a strategic change agent who integrates technological awareness, flexible thinking, emotional intelligence and ethical responsibility in order to steer digital transformation processes that enhance human capital development and organisational innovation. In smart city and public governance contexts, this role gains an additional ecosystemic dimension, as HR decisions influence not only internal organisational capacity but also the quality, inclusiveness and resilience of community-facing services.

A digital HR leader therefore:

- initiates digital innovation in HRM, formulates a coherent vision for workforce digital development and aligns HR strategy with wider organisational and societal digitalisation challenges. In environments where public institutions interact with diverse stakeholders, such alignment strengthens institutional adaptability and service responsiveness;
- ensures effective digital communication and interaction in multichannel, remote and hybrid formats, using e-team tools and social platforms to maintain cohesion, clarity and engagement across distributed teams. This capability is vital for public and municipal organisations that operate within networked governance structures;
- develops digital competences through inclusive learning ecosystems, leveraging microlearning, LMS/LXP platforms, adaptive digital curricula and personalised learning trajectories. Such initiatives help activate collective intelligence within organisations and support evidence-based decision-making across units, as demonstrated in research on municipal competence ecosystems [28];
- shapes a digital organisational culture based on trust, transparency, openness to change and data-informed management. This includes embedding shared norms of responsible digital behaviour, which directly contributes to organisational security and resilience, as highlighted by Boce [30];
- adheres to principles of digital ethics, ensuring transparency in the use of personal data, cybersecurity, equity of access and mitigation of digital discrimination risks. These aspects are particularly significant in public sector settings, where legitimacy and public trust depend on ethical and accountable data practices [27], [36], [31].

Taken together, the digital HR leader is not merely a technologically proficient manager but a systems thinker capable of designing an adaptive, inclusive and innovation-oriented HRM ecosystem. Such leaders strengthen organisational digital readiness, mobilise human potential and contribute to resilient smart communities by ensuring that HRM policies reinforce – rather than fragment – collective learning, social cohesion and sustainable digital transformation.

## 4. Digital leadership as a catalyst of digital competence development in smart and resilient ecosystems

### *4.1. Digital learning culture, upskilling and reskilling in smart city and public governance contexts*

In digitally transforming organisations, digital competencies cannot be treated as a static set of skills acquired once and applied indefinitely. They must be continuously renewed through upskilling and reskilling processes that reflect shifts

in technologies, labour markets and organisational models. Digital leaders play a central role in initiating and maintaining such processes by linking learning systems with strategic needs and long-term development priorities.

First, they formulate digital learning strategies that connect organisational goals with competence profiles. This includes identifying critical skill gaps, prioritising investment areas and aligning learning initiatives with transformation projects. For HRM 5.0, such priorities typically include data literacy, HR analytics, AI-assisted decision-making, remote collaboration management and digital well-being. In smart city environments, these competencies function not only as internal organisational assets but also as prerequisites for ensuring reliable public services, supporting crisis response and co-producing solutions with citizens, community groups and external stakeholders.

Empirical evidence from public-sector and regional digital transformations confirms the centrality of leadership in competence development. Schachtner and Baumann [28], analysing municipalities in Switzerland as a benchmark for EU smart regions, demonstrate that digital readiness depends less on individual skills and more on leadership-driven structures that institutionalise competence frameworks, foster cross-departmental learning cultures and align digital capabilities with strategic development trajectories. These insights reinforce the argument that digital leaders must embed competence development into organisational and regional transformation strategies rather than treat it as a discrete HR function.

Second, they transform learning formats by promoting microlearning, adaptive e-learning, mobile learning, simulations and gamification. Such formats support flexible, personalised and just-in-time learning, which is essential in hybrid work environments. They also foster new forms of collective learning, allowing employees, public servants and community partners to jointly test digital tools and governance innovations. This collaborative experimentation strengthens the collective intelligence of smart ecosystems, enhancing their capacity to respond to disruptions and coordinate complex actions.

Third, digital leaders promote inclusive access to learning. Recognising different levels of digital readiness across the workforce, they mitigate digital divides and design learning ecosystems accessible to employees of diverse ages, backgrounds and functional roles. This includes supportive onboarding for less digitally experienced staff and the development of learning resources that are usable for people with disabilities. Insights from smart-education research provide additional support. Nistorescu (Marinescu) [31] shows that universal and human-centred design principles are essential for building accessible digital learning environments in smart-city and smart-education ecosystems. These principles emphasise

usability, inclusiveness and the removal of technological barriers, ensuring meaningful participation for learners with diverse abilities. Applied to HRM 5.0, they underscore that digital leaders should integrate universal-design logics into LMS/LXP platforms, onboarding practices and reskilling pathways, thereby extending accessibility from education to workplace learning ecosystems.

Fourth, they institutionalise feedback and analytics. Using learning management systems (LMS), learning experience platforms (LXP) and HR analytics, digital leaders monitor participation, learning progress and programme outcomes, adjusting content and formats where necessary. Evidence from smart-economy research further illustrates the importance of such leadership. Alexandru [37] shows that digitally advanced economies increasingly require multi-source data literacy, AI-assisted analytical skills and the ability to operate in complex, data-driven environments. These competencies do not develop spontaneously; they must be cultivated through leadership-led learning ecosystems that integrate analytical tools, AI-enhanced training modules and continuous skill renewal. This demonstrates that digital leaders in HRM hold a pivotal role in preparing employees for data-intensive, AI-embedded work architectures characteristic of smart cities and digitally mature economic systems.

Through these mechanisms, digital leadership functions not as a passive supporter of training initiatives but as an engine of continuous competence development. By embedding learning processes into organisational structures and aligning them with smart governance and resilience objectives, digital leaders contribute directly to strengthening the collective intelligence and adaptive capacity of smart communities.

### *4.2. Leader as coach, mentor and facilitator in smart and resilient ecosystems*

In a human-centric perspective, digital leaders do not limit their role to designing learning systems; they also act as facilitators of individual and collective development. Their influence extends beyond competence-building processes to shaping interpersonal dynamics and organisational cultures that enable collaborative problem-solving, innovation and resilience.

As coaches, they help employees reflect on how digital transformation affects their work, identify personal development goals and build realistic learning trajectories. Coaching conversations often address uncertainties related to automation, changing professional identities or perceived risks of failure in digital environments. In smart-city and public governance contexts, such coaching contributes to strengthening the human resource base of local administrations, supporting the delivery of high-quality digital services and increasing institutional responsiveness during crises. This aligns with observations by Croitoru and Bercu [34], who argue that systematic development of human resources is a prerequisite for good governance and resilient public institutions.

As mentors, digital leaders share their own experiences in adopting and experimenting with digital tools, supporting employees in understanding both the possibilities and limitations of technological change. Mentoring relationships normalise experimentation and help cultivate psychological safety, a condition necessary for innovation in rapidly evolving environments. Reverse mentoring practices, where digitally advanced younger staff support senior managers, also play an important role in reducing skill gaps and accelerating technology adoption across organisational layers.

As environment designers, digital leaders create enabling conditions for collaboration and peer-to-peer learning. They support digital communities of practice, learning circles, job shadowing and cross-departmental innovation projects. These practices help to mobilise collective intelligence, allowing dispersed expertise to be combined in ways that strengthen organisational adaptability and contribute to the resilience of smart urban ecosystems.

This facilitative role gains particular significance where digital transformation produces uncertainty, cognitive overload or stress. By combining structural interventions (programmes, platforms, digital infrastructures) with relational behaviours (support, empathy, dialogue), digital leaders help employees build not only technical proficiency but also confidence, adaptability and agency. These qualities are crucial for sustaining innovation and reinforcing community-oriented solutions in smart cities.

To illustrate how digital leaders support competence development and organisational resilience, Table 1 presents a conceptual model summarising the three major facilitative roles and their contribution to smart HRM ecosystems.

Table 1. Coaching, Mentoring, Facilitation Model in Smart HRM Ecosystems

| **Role of the Digital Leader** | **Core Practices** | **Contribution to Smart HRM Ecosystems** |
|---|---|---|
| **Coaching** | Individual development dialogues; reflection on digital change; personalised learning trajectories | Enhances employee adaptability; strengthens organisational readiness for digital services; supports human capital development in public and private sectors |
| **Mentoring** | Knowledge-sharing; modelling digital behaviour; reverse mentoring | Reduces digital skill gaps; accelerates technology adoption; nurtures psychological safety and cross-generational learning |
| **Facilitation** | Creating collaborative environments; building communities of practice; enabling cross-functional projects | Mobilises collective intelligence; supports innovation; reinforces resilience of HRM and smart-city ecosystems |

***Source**: Author*

The model demonstrates that coaching, mentoring and facilitation are not isolated leadership practices, but interconnected mechanisms for cultivating a digitally resilient workforce. In smart-city ecosystems, these practices amplify organisational learning capacity, enabling institutions to respond more effectively to complexity, uncertainty and citizen expectations. This perspective provides a conceptual bridge to the next section, where digital leadership is analysed as a driver of organisational digital readiness.

Taken together, these coaching, mentoring and facilitation functions position digital leadership as a foundational mechanism for strengthening human capital in digitally transforming environments. They prepare employees for continuous learning, enhance their capacity to contribute to organisational goals, and mobilise collective intelligence needed for smart, resilient and community-oriented governance. These dynamics directly shape the organisation's digital readiness, which is explored in detail in section 5.1.

## 5. Interrelation between digital leadership and organizational digital readiness

### *5.1. Digital leadership as a driver of digital readiness*

Digital readiness does not arise spontaneously. It develops through intentional leadership actions rooted in strategic vision, flexible thinking and purposeful use of digital resources. In this sense, digital leadership functions as a primary catalyst of organisational readiness, directing transformation pathways, shaping cultural orientations and creating the conditions for coherent implementation of digital initiatives [3], [4], [35].

Digital leaders influence digital readiness by:

- formulating digital strategies that integrate technological innovations into business models and HRM architectures;
- identifying barriers and opportunities related to digital literacy, infrastructure gaps, organisational inertia and emerging technologies;
- aligning digital vision with people strategy and organisational capabilities, transforming it into concrete priorities for skills development, technological investment and policy adaptation;
- modelling digital behaviours through openness to experimentation, continuous learning and collaborative problem solving

Through everyday communication and decision-making, leaders embed values of adaptability and digital fluency into organisational routines. This is particularly relevant in hybrid and remote work arrangements, where shared norms and behavioural consistency are essential for performance. At the same time, such leadership practices strengthen the organisation's ability to respond to crises,

coordinate distributed teams and sustain functioning under uncertainty, which are core components of digital readiness in smart city ecosystems.

Findings from public administration research also reinforce the centrality of leadership-driven human capital development in building institutional readiness. Croitoru and Bercu [38] demonstrate that sustainable digital transformation and good governance depend not only on technological infrastructure but also on continuous human resources development and leadership capacity to cultivate competence-based organisational cultures. Their analysis clearly shows that digital readiness is a people-centred construct shaped by leaders who invest in capability building, ethical governance and long-term development trajectories.

This interpretation closely aligns with broader discussions in smart city scholarship, where resilient communities emerge when institutional preparedness, skilled human resources and participatory leadership reinforce one another. Digital readiness, therefore, is not a technical condition but a socio-technical capacity that enables organisations to mobilise collective intelligence, support inclusive service provision and maintain continuity of operations during disruptions. Within this perspective, digital leaders serve as orchestrators of alignment between technological innovation and human potential, ensuring that digital transformation enhances rather than destabilises community resilience.

### *5.2. Components of digital readiness dependent on leadership*

Digital readiness is a multidimensional organisational characteristic that includes infrastructure, culture, competencies, structures and leadership capacity. These components do not function independently. Their effectiveness depends, to a significant extent, on the quality of digital leadership, which determines how technologies are selected, how people engage with them and how collective capacity for transformation is built. OECD [36] emphasises that digital readiness emerges at the intersection of skills, culture and institutional capability, all of which are shaped by leadership decisions and behaviour.

Insights from smart-city research further reinforce this view. Benshams [38], analysing AI-driven transformation in multi-stakeholder urban environments, notes that cultural factors rather than technical sophistication often determine the success of implementation. This finding foregrounds the idea that readiness culture is a cornerstone of any digital transformation, especially in ecosystems where public institutions, private actors and citizens interact. Leadership therefore plays a central role in cultivating the norms, expectations and behavioural patterns that enable individuals and organisations to embrace new technologies.

Recent developments in digital public services illustrate the complexity of readiness even more clearly. Matusiak and Narożniak [29] , evaluating the Diia.pl digital identification system for Ukrainian citizens in Poland, show that effective adoption depends on more than technological efficiency. Trust in regulatory frameworks, data protection guarantees and human-rights safeguards critically shape public acceptance. Such evidence highlights that digital readiness in modern governance requires leadership capable of navigating technological, legal and human-centric dimensions simultaneously. This capacity becomes particularly important in smart city ecosystems, where trust in digital identification, e-services and crisis management platforms directly influences community resilience and civic participation.

Against this background, several components of digital readiness can be identified as particularly dependent on leadership influence:

- Technical infrastructure. Leaders initiate and coordinate modernisation efforts, including the implementation of LMS, CRM, ERP, HRM and analytics platforms. Their decisions shape not only the pace of technological adoption but also its integration with HRM and organisational goals.
- Digital culture. Leaders cultivate values such as openness, experimentation, knowledge sharing and continuous learning. These values sustain adaptability and help organisations effectively mobilise collective intelligence.
- Competence profiles. Leaders define strategic skill requirements, identify gaps and launch reskilling and upskilling initiatives. They ensure that competence development aligns with emerging technological demands and the organisation's transformation strategy.
- Organisational agility. Leaders introduce agile methodologies, decentralise decision-making and adjust structures to environmental volatility. Such agility is essential for responding to crises and maintaining operational continuity.
- Leadership networks. Leaders develop the capacities of middle and line managers through mentoring, peer learning and leadership development programmes. These networks distribute leadership responsibilities and strengthen the organisation's ability to act collectively.

Findings from smart-education research deepen this perspective. Nistorescu (Marinescu) [31] demonstrates that digital readiness is unattainable without embedding accessibility and human-centred design principles into digital systems. Accessibility thus becomes not only an ethical imperative but also a structural requirement for engaging diverse user groups and ensuring equitable participation. When applied to HRM ecosystems, this implies that digital leaders must purposefully integrate universal-design logic into learning systems, HR platforms and communication tools.

Taken together, these components underscore that digital leadership operates as an integrator within readiness architectures. Leaders align technological investments with human capabilities, translate strategic objectives into supportive structures and cultivate the trust and flexibility needed for transformation. Without cultural reinforcement, ethical orientation and sustained competence development, even advanced technologies remain underutilised, and the potential for organisational and community resilience is diminished.

### *5.3. Digital readiness in smart cities: extending the perspective to urban ecosystems*

In smart city settings, organisational digital readiness cannot be examined in isolation from the broader urban ecosystem. Public institutions, private organisations, civil society and technology providers operate as interconnected subsystems whose readiness levels influence each other. Digital leadership thus becomes a pivotal coordinating force that links internal organisational capabilities with external collaborative networks, ensuring that digital transformation contributes to community resilience rather than creating new divides.

Digital leaders in smart cities act not only as organisational strategists but also as ecosystem facilitators. Their actions determine how effectively institutions mobilise data-driven tools for service delivery, how they engage citizens in co-creation processes and how they coordinate multi-stakeholder responses during crises. In such environments, digital readiness becomes a shared resource that supports collective intelligence, enabling different actors to respond cohesively to disruptions, whether technological, social or environmental.

An organisation with strong internal readiness can therefore become a stabilising node in the smart-city network, contributing skills, infrastructure and governance models that reinforce the resilience of the whole ecosystem. Conversely, inadequate leadership capacity in one institutional subsystem may limit the effectiveness of the entire urban transformation effort. This interdependence underscores the need to conceptualise digital readiness not only as an internal organisational characteristic but as a relational capability embedded within a wider socio-technical system.

To capture this broader logic, the following integrative model is proposed (Figure 1). This framework summarises the interconnections discussed in the previous subsections and conceptualises digital readiness in smart cities as a systemic outcome that emerges from leadership-driven capabilities. It reflects the idea that digital leadership sets the conditions under which readiness components evolve and interact, ultimately influencing the resilience of the wider socio-technical ecosystem.

| | |
|---|---|
| **Digital Leadership** | Strategic vision |
| | Technological fluency |
| | Ethical and cultural orientation |
| | Adaptive mindset |
| | Human-centric development focus |
| ▼ *influences* | |
| **Digital Readiness Components** | Infrastructure maturity (ICT, platforms, interoperability) |
| | Digital culture (trust, openness, experimentation) |
| | Workforce competencies (literacy, analytics, AI-ready skills) |
| | Organisational agility (structures, processes, coordination) |
| | Institutional trust and inclusive design (accessibility, fairness) |
| ▼ *produces* | |
| **Resilient Ecosystem Outcomes** | Reliable, data-enabled public and organisational services |
| | Enhanced crisis responsiveness and continuity of operations |
| | Citizen engagement through participatory and transparent processes |
| | Collective intelligence mobilisation across sectors |
| | Social and economic resilience in smart-city environments |

**Fig. 1.** Digital Leadership, Readiness Components, Resilient Ecosystem Outcomes
***Source**: Author*

As the model illustrates, digital leadership operates as a generative force shaping both the internal readiness architecture of organisations and their contributions to the smart-city ecosystem. Organisations equipped with mature readiness components are better positioned to deliver stable and inclusive services, support multi-actor coordination and engage citizens in meaningful ways. These characteristics enable urban systems to withstand disruptions, adapt to emerging challenges and leverage collective intelligence for long-term sustainable development.

This integrative perspective provides the foundation for further discussion on how digital leadership shapes HRM ecosystems specifically, which will be examined in the next subsection.

### *5.4. Reverse effects: how digital readiness shapes leadership in smart and resilient ecosystems*

The relationship between digital leadership and digital readiness is fundamentally reciprocal, particularly in the governance and organisational landscapes that characterise smart cities. While digital leaders actively build readiness through strategic decisions, cultural interventions and competence development, the existing maturity of technological and institutional systems also shapes how leadership is exercised and how effective it can be.

In environments with low readiness, leaders often operate under constraints linked to outdated digital infrastructures, limited data interoperability, low digital literacy and rigid administrative structures. In such settings, leadership efforts shift disproportionately toward overcoming resistance, addressing fears of automation, resolving task fragmentation and managing operational crises rather than driving innovation [35]. Public-sector research repeatedly shows that when institutional trust, regulatory clarity and digital safeguards are weak, leaders are compelled to adopt risk-averse and defensive strategies rather than proactive, transformative approaches [29], [30]. As a result, leadership energy is channelled into maintaining minimum functionality rather than building resilient, innovation-oriented capacity.

In contrast, digitally mature organisations and public institutions create an environment in which leaders can operate in more developmental, participatory and facilitative ways. High levels of interoperability, stable digital platforms and reliable analytics systems enable leaders to make evidence-based decisions, adopt coaching-oriented leadership styles and support autonomous team functioning [3], [16]. These conditions foster psychological safety, shared responsibility and collaborative learning – qualities essential for mobilising collective intelligence across departments and within the wider urban ecosystem.

Importantly, digital readiness determines not only the style of leadership but also its strategic horizon. In mature smart-city ecosystems, leaders can engage with ecosystem orchestration, co-designing services with citizens, coordinating responses with private and civil-society partners and leveraging AI-enabled tools for anticipatory governance. Smart-city research shows that digital maturity amplifies leadership capacity to stimulate innovation, build cross-sector partnerships and mobilise distributed expertise for crisis response and long-term community resilience [38], [32], [33].

Thus, digital readiness is not merely an operational condition. It is a structural multiplier that enhances leadership effectiveness, expanding the bandwidth of what leaders can achieve. It shapes how quickly innovations can be scaled, how effectively teams self-organise and how institutions collaborate with external partners. In smart cities, where resilience depends on coordinated interdependencies among diverse actors, the readiness level of one organisation can significantly influence the adaptive capacity of the entire urban ecosystem.

### *5.5. Maturity model of digital leadership in smart, resilient and interconnected ecosystems*

To understand the developmental trajectory of digital leadership within smart-city and HRM ecosystems, a maturity model provides a systematic framework for mapping the evolution from basic digital tool use to ecosystem-level orchestration.

Drawing from leadership studies [1], [8], digital transformation scholarship [4], [24], and recent evidence from smart governance and human-centric innovation [38], [31], [33], a five-level maturity model can be articulated as follows. To illustrate the developmental trajectory of digital leadership within smart-city and HRM ecosystems, a maturity model can be used to show how leadership evolves from basic digital engagement to ecosystem-level orchestration. The model integrates insights from leadership and digital transformation research and reflects the increasing importance of resilience, inter-organisational collaboration and collective intelligence in contemporary urban governance. Table 2 summarises the key characteristics of each maturity level and their implications for organisational and ecosystem performance.

Table 2. Maturity levels of digital leadership in smart and resilient ecosystems

| **Maturity level** | **Key characteristics** | **Implications for smart-city and organisational resilience** |
|---|---|---|
| **1. Basic (reactive)** | Fragmented and sporadic use of digital tools<br>Poor integration of ICT into organisational processes<br>Leadership crisis-oriented and focused on operational survival<br>Minimal engagement with digital culture, accessibility or ethics | Organisations struggle to participate meaningfully in smart-city networks and often depend heavily on external support during disruptions. |
| **2. Functional (operational)** | Adoption of basic HRM, administrative and communication systems<br>Initial participation in digital projects and compliance-driven initiatives<br>Competence development remains ad hoc and uneven<br>Leadership shifting from reactive to task-coordinating | Internal processes stabilise, enabling the first foundations for structured collaboration with other institutions and digital initiatives. |
| **3. Strategic (transfor-mational)** | Coherent digital strategies aligned with institutional missions and HRM priorities<br>Systematic reskilling and upskilling based on skill audits<br>Introduction of digital KPIs and analytics-driven decision-making<br>Development of a value-based digital culture emphasising transparency and experimentation | Organisations become proactive contributors to urban digital transformation and begin supporting resilience-oriented policies and community-centred services. |
| **4. Systemic (integrated)** | Digital leadership embedded in organisational identity and governance<br>Distributed leadership via e-mentoring, peer learning and shared authority<br>High adaptability and flexible team structures<br>Strong interoperability with city-wide platforms and data ecosystems | Organisations demonstrate the capacity to absorb shocks, collaborate across sectors and generate shared value with public, private and civic partners. |
| **5. Break-through (ecosystem)** | Leaders orchestrate inter-organisational networks and smart-city partnerships<br>Emphasis on ethical AI, sustainability, digital inclusion and accessibility<br>Use of predictive analytics, real-time data and participatory platforms<br>Active mobilisation of collective intelligence | Digital leadership becomes an ecosystem governance function, shaping community resilience, enabling innovation and supporting adaptive, long-term urban development. |

***Source**: Author*

As Table 2 demonstrates, higher levels of digital leadership maturity enable organisations to contribute more effectively to smart-city resilience, cross-sector collaboration and citizen-centred innovation. Leadership development therefore becomes a strategic investment not only for improving internal HRM processes but also for strengthening the adaptive capacity of the broader urban ecosystem. Transitioning from reactive to ecosystem-oriented leadership depends on technological readiness, institutional trust, competence development and culturally grounded digital practices, all of which shape the potential for long-term, sustainable transformation.

*Integrating the maturity model into smart-city discourse.* Progression through these levels is seldom linear. It depends on: investments in leadership development (digital academies, coaching, mentoring); readiness of digital infrastructures and data ecosystems; institutional trust and regulatory clarity; inclusiveness and accessibility of digital services; organisational openness to cross-sector collaboration

In smart cities, where digital transformation is both a technological and a social process, the maturity of digital leadership shapes not only organisational outcomes but also the adaptive capacity of urban ecosystems. Leaders at higher maturity levels amplify resilience, strengthen participatory governance and nurture cultures of collective intelligence, ensuring that digital transformation contributes to equitable and sustainable development.

## 6. Digital leadership and HRM ecosystem development

### *6.1. Roles of the digital leader in HRM ecosystems*

The notion of an HRM ecosystem reflects the expanding boundaries of human resource management, encompassing internal HR processes, digital platforms, external partners, regulatory frameworks and labour market dynamics. In smart city environments, these ecosystems intersect directly with municipal governance systems, regional innovation networks and civil society organisations. As a result, human-centric digital leadership becomes not only an organisational capability but also a connecting mechanism that links institutional goals with community needs, service quality and public value creation.

Within such interconnected ecosystems, digital leaders take on a wider set of responsibilities that extend beyond traditional HR functions and require the ability to navigate socio-technical complexity, multi-stakeholder coordination and evolving digital infrastructures. Their roles can be conceptualised across several interrelated domains.

- *Business transformation strategists.* Digital leaders align HRM digital strategies with broader organisational and city-level transformation agendas.

They ensure that HR processes support emerging business models, smart service delivery, automation initiatives and talent strategies consistent with urban development priorities. In smart city ecosystems, this strategic alignment contributes to more coherent public–private–civic partnerships and reinforces institutional adaptability.

- *Agents of digital learning culture.* They design and promote continuous learning programmes, microlearning pathways, mentoring systems and talent mobility frameworks that foster workforce agility. These activities support not only organisational needs but also the wider goal of equipping employees and public servants with competencies essential for participating in data-intensive, AI-enabled smart-city environments. By modelling lifelong learning, digital leaders help embed a culture that strengthens organisational and community resilience.
- *Integrators of digital solutions.* Digital leaders coordinate the implementation, integration and optimisation of HRM technologies, including ATS, LMS/LXP, performance management platforms, payroll systems and analytics suites. Their integrative role ensures that HRM digital tools function as interconnected components within larger organisational and city-wide infrastructures. Effective integration enables interoperability with municipal platforms, improves data coherence and supports evidence-based decision-making.
- *Orchestrators of cross-functional collaboration.* They facilitate collaboration across HR, IT, finance, operations, legal departments and analytics teams. This orchestration is crucial in smart governance settings, where digital initiatives often require multi-domain expertise and collective intelligence. Digital leaders build relational bridges that enable co-creation of solutions, improve communication flows and enhance organisational responsiveness to emerging challenges.
- *Facilitators of digital culture.* They shape organisational norms and values that legitimise experimentation, responsible risk-taking, knowledge sharing and open communication. Such cultural leadership is fundamental for mobilising employees and stakeholders in digital transformation projects. In smart-city ecosystems, a strong digital culture contributes to trust in new technologies, employee engagement in service innovation and the co-production of solutions with citizens.

### *6.2. Transformational impact on HRM ecosystem domains*

Digital leadership generates transformational effects across the core domains of the HRM ecosystem, shaping how organisations evolve, learn and interact within broader smart-city infrastructures. Its influence extends beyond isolated HR processes and operates as a systemic mechanism that connects technological

innovation with cultural development, institutional governance and long-term workforce resilience.

- *HR architecture.* Digital leaders redesign key HR processes – recruitment, onboarding, learning and development, performance management and succession planning – by integrating AI-assisted screening, digital onboarding journeys, personalised learning dashboards and analytics-supported talent pathways. This reconfiguration creates more transparent, adaptive and experience-oriented HR systems capable of operating effectively in hybrid and multi-stakeholder environments.
- *Communication infrastructure.* They develop multi-channel communication ecosystems incorporating internal social networks, collaboration hubs, mobile communication tools and real-time reporting dashboards. These infrastructures sustain continuous information flows and enable rapid feedback loops that are essential for coordinated action in smart governance and public-service contexts.
- *Digital competence development***.** Digital leaders introduce digital maturity profiles, conduct systematic skill audits and design targeted learning strategies to address critical gaps. By doing so, they support the formation of a workforce that can operate confidently within data-intensive, AI-enhanced and technologically dynamic urban systems.
- *Organisational agility.* Through agile methodologies, iterative project structures and decentralised decision-making processes, leaders enhance the organisation's capacity to respond quickly to emerging challenges and opportunities. Agility becomes a structural condition for participating in smart-city ecosystems where volatility, technological acceleration and interdependence are the norm.
- *Analytical capability.* They promote the adoption of HR analytics, predictive modelling and ROI evaluation for learning and talent interventions. Analytical maturity strengthens evidence-based decision-making and ensures that digital transformation aligns with strategic workforce and organisational goals.

These transformation pathways are closely aligned with broader labour-market and smart-city trends. Fabrègue, Portal and Cockshaw [32] demonstrate that cities with robust digital infrastructures, strong innovation cultures and people-centred governance models attract significantly more highly skilled digital workers. Their work highlights that talent mobility is shaped not only by technological sophistication but also by leadership-driven factors such as inclusiveness, psychological safety, meaningful work and opportunities for learning. For HRM ecosystems, this means that digital leaders must combine technological integration with human-centric values to build environments that foster talent retention, collaboration and innovation.

Recent research on AI-enabled transformation further reinforces this point. Necula [33] shows that artificial intelligence acts as a catalyst of sustainable digital transformation in smart-city ecosystems, enabling organisations to anticipate disruptions, adapt processes and accelerate innovation cycles. Applied to HRM, these insights suggest that digital leaders must extend their competencies beyond technical coordination to include AI-driven sensemaking, predictive modelling and adaptive learning. The ability to responsibly harness AI thus becomes a defining feature of organisational resilience and an essential driver of HRM ecosystem sustainability.

Taken together, these ecosystem-wide effects illustrate that digital leadership operates as a structural force shaping the technological, behavioural and cultural dimensions of HRM. From a smart-city perspective, this structural role extends beyond organisational boundaries. HRM systems influenced by digital leadership contribute to attracting and developing talent capable of co-creating solutions with citizens, engaging in collaborative innovation and reinforcing the resilience of urban communities during periods of disruption. Digital leadership therefore becomes an essential lever through which HRM ecosystems support collective intelligence, public value creation and the long-term adaptability of smart cities

## 7. Discussion and implications for HRM 5.0

The conceptualisation of human-centric digital leadership presented in this study carries important implications for the evolution of HRM 5.0. The shift from early technocratic interpretations of e-leadership toward integrative, ecosystemic and people-centred frameworks mirrors broader transformations observed in smart governance and smart-city research [1], [2], [24], [16]. Digital leadership, as shown throughout this paper, should be regarded as a structural element of HRM capable of shaping digital readiness, competence development and organisational resilience. In smart-city contexts, human-centric digital leadership becomes even more consequential because it influences how collective intelligence is mobilised across public institutions, employers and civic actors to address complex societal challenges.

First, digital leadership must be understood as a core HRM competence. Evidence shows that leadership behaviours strongly determine how digital solutions are adopted, how digital culture forms and how innovation is enacted [3], [21], [35]. Research in the SCIC/SCRD community further confirms this. Benshams [38] demonstrates that organisational culture is the primary determinant of AI integration outcomes in smart-city environments, emphasising that leaders shape cultural conditions for successful digital adoption. Croitoru and Bercu [38] similarly show that human resources development is foundational for good governance and sustainable digital transformation in public institutions. These

findings reinforce the need for explicit leadership development pathways across all maturity stages – from foundational ICT fluency [8], [20] to advanced ecosystem orchestration [4], [5].

Second, leadership development should be integrated with digital readiness diagnostics. Many organisations conduct digital maturity audits without assessing leadership capacity [6], and leadership programmes often lack alignment with digital strategies [2], [19]. As this study suggests, digital leadership competencies should correspond to readiness indicators including digital culture, infrastructure robustness and learning-system maturity [36]. Evidence from recent smart-region studies supports this alignment. Schachtner and Baumann [28] show that municipal digital readiness depends not only on individual skills but on leadership-driven institutional structures that promote cross-departmental learning and data-driven governance. Therefore, leadership assessments and digital readiness audits must be treated as interdependent mechanisms of HRM 5.0.

Third, educational institutions must modernise HRM and management curricula. Smart-city studies consistently show that leadership shortages impede digital public-service innovation. Matusiak and Narożniak [29] illustrate how legal, technological and human-rights frameworks surrounding digital identity systems require leaders capable of navigating socio-technical complexity and public trust. Alexandru [37] highlights that smart economies demand advanced data literacy and AI-enhanced analytical skills, reinforcing the need for curricula that prepare leaders for data-intensive decision environments. Digital leadership education should therefore incorporate simulations, crisis-management cases, analytics tools and training in digital ethics, inclusiveness and accessibility [7], [13], [36].

Fourth, digital leadership must prioritise ethics, inclusion and well-being. Studies on virtual collaboration consistently highlight the importance of trust, psychological safety and work–life balance [11], [12], [13]. Research from the SCRD Journal strengthens this argument. Boce [30] shows that human behaviour remains one of the most significant internal threats to cybersecurity, meaning that digital leadership must address ethical decision-making, responsible data governance and secure digital practices. Nistorescu (Marinescu) [31] demonstrates that universal and human-centred design significantly improves accessibility in digital learning environments – a principle directly relevant for HRM 5.0 systems. These findings underline that digital leaders must create conditions for equitable participation, transparent communication and ethical integration of emerging technologies.

Fifth, ecosystem-wide implications highlight the strategic importance of digital leadership for smart-city resilience. Fabrègue, Portal and Cockshaw [32] show that

cities with strong digital infrastructures and people-centred governance are more successful in attracting and retaining highly skilled workers, confirming that talent ecosystems depend on leadership that integrates technology with well-being, inclusiveness and meaningful work. Necula [33] demonstrates that AI can serve as a catalyst for sustainable innovation in smart-city environments, but only when leadership actively cultivates organisational resilience, predictive capability and ethical safeguards. These studies collectively affirm that digital leadership is not merely an organisational competence but a governance capability shaping how HRM systems contribute to resilient, innovative and citizen-oriented smart-city ecosystems.

The reviewed SCIC/SCRD studies enrich the theoretical model developed in this paper by illustrating how digital leadership operates at the intersection of technology, governance and human capital. Benshams [38] underscores that digital transformation outcomes in smart cities depend more on leadership-shaped culture than on technological sophistication. Matusiak and Narożniak [29] reveal the crucial role of leadership in navigating legal and human-rights dimensions of digital identity infrastructures. Schachtner and Baumann [32] and Fabrègue et al. [32] demonstrate that talent attraction and institutional readiness hinge on leadership-driven learning and governance structures. Nistorescu [31] and Boce [30] highlight that ethical, accessible and secure digital environments require human-centric leadership interventions. Necula [33] confirms that AI-driven innovation depends on leadership capacity to integrate predictive tools with sustainable transformation goals. Taken together, these studies validate the paper's central argument that human-centric digital leadership is a systemic enabler of resilient HRM ecosystems and a foundational capability for advancing smart-city development.

## 8. Conclusions

This article has provided a comprehensive conceptual analysis of human-centric digital leadership as a phenomenon shaping digital competences, organisational digital readiness and the development of HRM ecosystems. The findings allow formulation of several interconnected conclusions.

First, digital leadership plays a foundational role in developing human capital under conditions of digital transformation. Digital leaders act as strategic change agents, designers of learning ecosystems and coordinators of HRM architectures. They initiate reskilling and upskilling pathways, construct personalised learning trajectories and promote cultural values such as continuous learning, adaptability, experimentation and responsible innovation. These functions position digital leadership as a core enabler of HRM 5.0.

Second, the relationship between digital leadership and digital readiness is inherently bidirectional. Digital leaders contribute to organisational digital maturity through strategic alignment, competence development, digital-culture formation and ethical governance. At the same time, the level of organisational readiness – including infrastructure quality, analytical capability, regulatory clarity and trust – determines the extent to which leadership initiatives can be successfully implemented. Evidence from smart-city research confirms that readiness conditions fundamentally shape digital transformation outcomes.

Third, digital leadership exerts systemic influence on HRM ecosystem architecture. By integrating digital tools into talent management, communication systems, data analysis processes and organisational adaptation mechanisms, digital leaders drive structural and behavioural transformation. These changes reinforce productivity, agility, innovation and collaborative problem-solving. Findings from smart-city labour-market studies further show that such system-level leadership contributes to talent attraction and retention and strengthens urban innovation capacity.

Fourth, contemporary digital leadership extends far beyond technocratic coordination of virtual tools. It requires emotional intelligence, mentoring and coaching competencies, sensitivity to ethical dilemmas, and the ability to model inclusive and psychologically safe behaviour. Research on human-centred design and cybersecurity demonstrates that digital culture, accessibility and trust depend more on leadership-driven behaviours than on technological sophistication.

Fifth, the author's definition of digital leadership reflects its integrative, ecosystemic and value-based nature. It conceptualises digital leadership as the ability to combine strategic vision, technological fluency, cultural stewardship and adaptive human behaviour into a coherent mechanism for navigating digital transformation. This approach synthesises key perspectives from the literature and responds to contemporary challenges such as digital divides, hybrid work models and the complexity of smart-city governance.

Finally, in the broader context of smart cities and resilient communities empowered by collective intelligence, human-centric digital leadership emerges as a crucial connector between technological infrastructures and the lived experiences of citizens. By influencing how organisations recruit, develop and support their workforce, digital leaders indirectly shape urban resilience, innovation capacity and social cohesion. Insights from SCIC and SCRD studies [38], [29], [28], [30], [32], [37], [31], [33], [34]. demonstrate that successful smart-city strategies depend on leadership that integrates technology with human-centred values, ethical responsibility and long-term workforce development.

For organisations and HR practitioners, these findings underscore the need to prioritise digital-leadership development as a strategic investment. Programmes in digital ethics, data literacy, AI-assisted decision-making, accessibility and ecosystem collaboration generate multiplicative effects on readiness, innovation and resilience. For researchers, the proposed conceptual framework offers a foundation for empirical validation, operationalisation of digital-leadership constructs and comparative studies across sectors and national contexts.

Ultimately, digital leadership emerges not only as a prerequisite but also as a multiplier of HRM digital transformation, enabling organisations and urban ecosystems to convert digital challenges into opportunities for sustainable development, collective intelligence and human-centred innovation.

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