

Digital Entrepreneurship: Leadership Skills for Driving Tech-Based Ventures

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1. Introduction

Digital entrepreneurship, defined as creating new ventures or transforming existing businesses using novel digital technologies, is gaining importance as a driver of economic growth and innovation. It offers opportunities for remote work, gender equality, and social inclusion (Zhao & Collier, 2016; Welsum, 2016). Success in digital entrepreneurship depends on entrepreneurial behavior, culture, strategies, and a supportive innovation ecosystem involving various stakeholders (Zhao & Collier, 2016).

Digital entrepreneurship is transforming business landscapes, particularly in developing nations such as India. Digital leadership skills are crucial for successful digital entrepreneurship in today's rapidly evolving business landscape. Digital entrepreneurship requires leaders with specific competencies to drive successful digital transformation. Research indicates that a lead entrepreneur's digital leadership positively influences digital entrepreneurial success through technology absorptive capacity and technological innovation capability (Xia et al., 2023). However, some studies suggest that digital leadership alone may not significantly impact digital skills development in young entrepreneurs (Fachrurazi, 2023). To foster digital transformation entrepreneurship, leaders need to possess six critical competencies: visioning, sensing, strategizing, connecting, learning, and innovating (Schiuma et al., 2021). These competencies form the transformative leadership compass, which helps leaders create an organizational culture conducive to digital transformation. While digital leadership is crucial, collaboration also plays a significant role in enhancing digital skills among young entrepreneurs (Fachrurazi, 2023). Overall, effective digital leadership combined with collaboration and specific competencies is essential for successful digital entrepreneurship in the rapidly evolving digital landscape. As digital technologies become integral to modern business, digital leaders must be able to stimulate teams for experimentation and improve business performance (Kalashnikov et al., 2019). Leaders who are forward-thinking and proactive are more likely to drive digital innovation, which is crucial for startups aiming to disrupt established markets (Zulu and Khosrowshahi, 2021).

Digital leadership has emerged as a crucial concept in the modern business ecosystem, characterized by the integration of digital technologies and collaborative approaches (Tutar & Güler, 2022). Essential components of digital leadership include digital acumen, cybersecurity knowledge, and the ability to leverage advanced technologies like AI and cloud computing (Kaiyai et al., 2024). Digital leadership is essential for steering digital transformation, which is a critical component for the success of tech startups. Digital leadership significantly influences innovation within startups by promoting a culture that encourages creativity and experimentation. Leaders must possess the ability to integrate digital technologies into business operations effectively. The transformative leadership compass outlines competencies such as digital vision and knowledge, which are vital for leaders to guide startups through digital transformation (Mihardjo et al., 2019; Schiuma and Carlucci, 2021; Rakovic et al., 2024).

The new digital environment calls for a need to change traditional leadership mindset, however there is need for more theoretical contribution specially in the context of tech-based start-ups. There is a gap in literature in the leadership capabilities in the digital scenario (Tigre et al., 2024). With increasing tech-based start-ups there is a

need to explore leadership competencies required to successfully manage digital transformation and such technology-driven companies (Rakovic et al., 2024).

India is becoming the hub for tech-based start-ups. It's large and diverse consumer is encouraging the technology-driven companies in the country. The success of technology-driven businesses is largely dependent on the leadership skills of the entrepreneur. The founders' leadership abilities and entrepreneurial vision are crucial success elements for technology-driven firms. (Chatterjee and Gupta, 2019; Patel et al., 2024). As tech-based ventures expand and grow in India there is a need for leaders to adopt skills that support such transformations.

The field of digital leadership skills among entrepreneurs have limited conceptual, empirical, and topical foci. The attempts to answer the research question : What digital leadership capabilities are essential for entrepreneurs in tech-based ventures, and how can these be developed to ensure success in the digital era?

The study aims to examine the conceptual and empirical research in the field of digital leadership. It attempts to examine the research gap in the field of Digital Skills among entrepreneurs with specific focus on tech-based ventures. Based on a systematic literature review, propose a skills framework required in tech-based ventures in leadership position. This study aims to close the gap by identifying the leadership capabilities that that entrepreneurs need to thrive in the digital environment, by adding new insights to leadership literature. The study concludes by recommending strategies for Digital Leadership development to succeed in tech-based ventures.

2. Review of Literature

2.1 Digital Entrepreneurship

Digital entrepreneurs leverage digital technologies such as IOT, artificial intelligence (AI) etc to automate tasks traditionally requiring human labor. (Raghunath & Patro, 2024). Digital platforms enable entrepreneurs to expand their reach to both domestic and international markets, facilitating communication with customers and creating opportunities for business growth (Atanasova, 2022). Key characteristics of digital entrepreneurs include autonomy and self-discipline, which are essential for navigating the dynamic digital landscape. These traits empower entrepreneurs to take initiative and maintain focus on their goals. Digital entrepreneurs are often characterized by their innovative mindset and ability to gain insights into emerging trends and technologies. This allows them to identify and capitalize on new opportunities in the digital economy (Chuang et al., 2022). Digital leadership plays an important role in enhancing employee innovativeness create a culture of innovation that is required in digital entrepreneurship. Such an approach empowers employees to embrace new ideas and technologies, ultimately driving organizational success (Hidayat, 2024)

However, the success of digital entrepreneurs often hinges on their ability to navigate these challenges and leverage the unique characteristics of digital entrepreneurship to their advantage.

2.2 Digital leadership

Conventional theories leadership lack focus on the influence of digital transformation and the need of a transparent approach in leadership. Digital leaders support 'inverse transparency' by empowering employees through a transparent process with regards to the flow and usage of data in the organizations (Gierlich-Joas et al., 2019). Traditional leadership mindset would not support digital the current digital environment (Tigre et al., 2024)

'Inverse transparency' is a concept in which data is made visible to people who is use it and empowers employees by challenging traditional power approaches. Gierlich-Joas et al, (2020) suggested that new digital technologies drive 'Digital leadership innovations' and Digital leadership aims to support digital ventures at leadership level firm level and societal level.

Transformational leadership, characterized by inspiring and motivating teams, has a significant positive impact on entrepreneurial innovation. Transformative leadership enables entrepreneurs by communicating a compelling vision, inspiring trust and encouraging employees to excel. Such an approach promotes creativity, continuous improvement and risk taking. Digital leadership integrates transformational leadership style with adoption of digital technology (De Waal et al., 2016)

Digital leadership has been defined as individuals who add value to the organizations by combining the abilities of the leaders with digital technologies (Rudito and Sinaga, 2017). According to Mihardjo et al., 2019 defined digital leadership as ‘a combination between digital culture and digital competence’ (p. 1750; Mihardjo et al., 2019) based on the Upper Echelons Theory.

Digital leadership plays an important role in steering organisational transformation amidst the impact of disruptive technologies and innovation. It is characterized by global vision, creativity, resilience, and profound thinking, aligning with the transformative nature of Industry 4.0. In this era, firms must develop ecosystems that are innovative, based on standard processes, modular and interoperable through decentralization, seeking real-time feedback, and a service-orientation.

Digital leadership enhances entrepreneurial intentions by fostering a culture of innovation and value co-creation. This is particularly evident in religious organizations, where digital leadership, combined with innovation capabilities, empowers communities to engage in economic initiatives (Ohman et al., 2025).

Digital leadership integrated transformation leadership and the adoption of digital technology (De Waal et al., 2016). According to Zhu (2015), there are five characteristics of digital leadership, such as : creative, though, a global visionary, inquisitive and profoundness. Transformational leadership facilitates organizations' innovation capability, which is the foundation of digital transformation. Transformational leadership has been found to influence e-business adoption (Alos-Simo et al., 2017).

Digital leadership characteristics align with the innovative demands of Industry 4.0. It support organizational transformation amid technological disruption in business. Digital leadership impacts customer experience orientation in developing business model innovation. Such leaders must develop a global mindset and develop strong network to create a culture of innovation (Mihardjo et al., 2019).

2.3 Transformational Leadership

The Transformational leadership theory is one of the most cited theories in research. Transformational leaders possess a clear and compelling vision that aligns their team's efforts with organizational objectives. This visionary approach is crucial for guiding entrepreneurs through uncertain environments and fostering innovation. Dewi (2024) emphasizes the importance of visionary leadership in driving organizational stability and advancement by focusing on market dynamics. Transformational leadership is positively associated with entrepreneurial orientation, which contributes to SME performance (Rose & Mamabolo, 2019). Such leaders serve as role models, motivating employees to align their efforts with the organization's objectives. They encourage a culture of risk-taking and experimentation particularly risk-taking, significantly influences transformational leadership and startup performance. Such leaders can use their referent power and visionary process impacting entrepreneurial ventures (You & You, 2019; Rose & Mamabolo, 2019; Dewi, 2024).

2.3 Upper Echelon Theory (UET)

The Upper Echelon Theory (UET) suggests that attributes of top management teams (TMTs), namely experiences, values, and personalities, significantly influence organizational outcomes. It suggests that organizations are reflections of their top managers, as these individuals' interpretations of situations and strategic choices are shaped by their personal attributes. In the context of digital leadership, UET provides a framework for understanding how these personal characteristics can influence digital transformation and strategic decision-making in organizations (Herman and Smith, 2015). UET also connects with digital leadership through the integration of big data analytics capabilities. TMTs with a strong technological orientation can leverage these capabilities to enhance strategic outcomes, especially in dynamic environments (Achyar, 2024)

2.4 Tech Based Ventures

Digital transformation can be classified as a business transformation driven by emerging technologies (Tang, 2021). While businesses that are not digitally mature adopt technologies such as e-commerce, social media analytics, and mobile applications (Kane et al., 2015) how ever advanced ventures adopt the Internet of Things (IoT), cybersecurity, big data and analytics, cloud computing, robotic process automation (RPA), artificial

intelligence (namely machine learning), blockchain, and others (Tang, 2021). Digital leadership enhances organizational dynamic capabilities, particularly in fragile micro-startups (Gao et al., 2024)

Digital transformation plays a crucial role in enhancing the technological innovation capabilities of technology-based startups. It serves as a driving force for innovation by alleviating financing constraints, thereby enabling these enterprises to adopt emerging technologies and integrate them into their innovation activities (Sun, 2024).

Tech-based ventures, often referred to as technology-based firms or startups, exhibit distinct characteristics that differentiate them from traditional businesses. Tech-based ventures often exhibit characteristics such as adaptability to change, leveraging digital technologies, and a focus on innovative business models. They typically emerge from disruptions in traditional industries, utilizing capabilities inherited from previous experiences, such as firms like Swiggy and Nykaa.

Boudlaie et al., 2020 identified characteristics of new technology-based firms (NTBFs) and presented 5 unique attributes such as new firms founded during the last 10 years; Adoption of high technology to focus on advanced knowledge and innovation; Independence, where the majority of capital is owned by the founding team and not part of larger firms; small team size and firms funded primarily by the founders.

The authors define Tech-based ventures as *‘businesses that adopt and leverage new-age technology core component of their products or service to create value, improve efficiency, and foster scalability in competitive markets’*

3. Research Methodology:

To objectives of the study are achieved through , a systematic literature review approach was adopted to explore digital leadership in entrepreneurial settings. Through literature review, key studies and frameworks were analysed to seek insights on the digital leadership skills in digital entrepreneurial settings and strategies for leadership development.

The TCCM approach is one of the popular and structured approach for systematic reviews (Sharma et al., 2020; Olaleye et al., 2021). This approach helps to analyse and synthesize research by examining major/dominant theoretical frameworks, contextual factors, most cited papers and key characteristics of the research. The methodologies adopted for research are examined in this approach.

Additionally RStudio and Bibliophagy were used for data visualization of thematic map of the density and centrality of research on Digital leadership. The objective of this analysis was to present the research gap of Digital leadership in tech-based ventures or digital ventures in India.

3.1 Article selection and data gathering process

The data used in this study were retrieved on Feb 10, 2025, from Elsevier’s Scopus. The objective of using Scopus data was to review quality and referred paper for review.

Table 1 : Data gathering procedure demonstrating the search string for Scopus database :

Database	Filters	Output
Scopus	TITLE-ABS- KEY (digital AND leadership) AND (LIMIT- TO (SUBJAREA , "BUSI")) AND (LIMIT- TO (DOCTYPE , "ar")) AND (LIMIT- TO (EXACTKEYWORD , "Leadership") OR LIMIT- TO (EXACTKEYWORD , "Digital Transformation")) AND (LIMIT- TO (LANGUAGE , "English")) AND (LIMIT- TO (SRCTYPE , "j")) AND (LIMIT- TO (PUBSTAGE , "final"))	295

Out of 295 Top 50 most cited paper were identified. Further screening for eligibility was carried out and top 30 paper were selected for analysis.

4. Results :

In the following section, we discuss the results of our analysis based on the TCCM approach of Structured Literature Review :

4.1 Theory Development

The major theme of theory developments in the field of Digital Leadership is around Upper Echelon Theory, Transformational Leadership Agency, and Contingency theories. The core proposition of the Upper Echelon Theory is that characteristics of management teams or leaders such as they values, personality and experience influence organizational outcomes. Transformational Leadership is one of the most influential theories emerged in contemporary literature that focuses on driving innovation and enhancing employee engagement to achieve organisational goals. Such an approach also is characterized by the ability of the leader to articulate a compelling vision, inspire trust, and encourage employees to exceed their usual performance levels. Leaders who adopt this style are adept at identifying and nurture talent.

4.2 Context of study

Digital leadership has been examined in various contexts, such as manufacturing, banking, IT experts, education. However there was one study among Technopreneurs that emerged in the area of Digital Leadership. However, no studies were found among digital leadership or skill in the Indian context. There was a lot diversity in terms of industry context and hence it is challenging to state which industry context has the most research output related to Digital leadership. 8 studies were across multiple industry contexts. Additionally in terms of the context of the study, 10 studies were industry specific, 6 were cross-regional, 12 were regional level and others were at organizational level. As the contexts of Digital leadership is diverse, the skills require may be very context specific.

4.3 Characteristics

Our review of literature reveals the characteristics of studies carried out in digital leadership. As shown in Figure 1, four themes were generated by Biblioshiny broadly classified into development degree (vertical) and relevance (Centrality) horizontal axis. The four thematic areas were motor theme that most developed and central research topics.

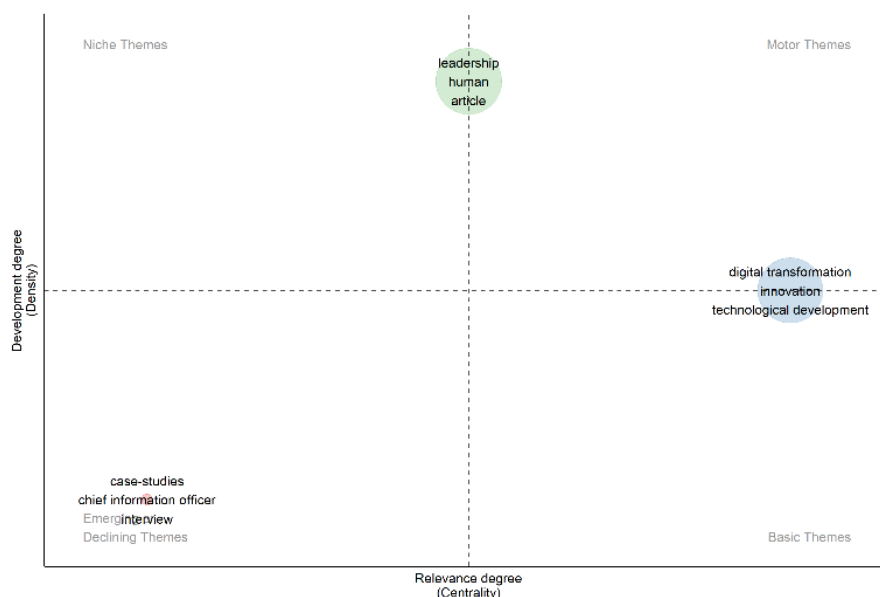


Figure 1 : Thematic areas

Survey-Based studies dominate the research landscape (14 studies), reflecting a strong preference for quantitative data collection to measure variables related to digital leadership. This trend indicates the field's focus on generalizability and statistical analysis to validate findings across diverse contexts. Case-Study Method (3 studies) and Interviews (2 studies) are utilized to explore contextual and behavioral dimensions of digital leadership, offering rich, in-depth insights into leadership practices within organizations. These methods help uncover nuances that surveys might overlook, such as leadership styles and cultural influences. fsQCA (Fuzzy-Set Qualitative Comparative Analysis) (2 studies) highlights a growing interest in configurational approaches that explore complex causality and multiple pathways leading to successful digital leadership outcomes. Literature Reviews (6 studies) contribute significantly by consolidating existing theories, frameworks, and models on digital leadership. These studies help in mapping the evolution of digital leadership concepts and identifying research gaps.

[illegible][illegible]

The above thematic analysis using Co-occurrence Network and Word Cloud Analysis indicated a strong connection between leadership and digital transformation in existing literature. Leadership appears to have a high degree of centrality with the keywords ‘Human’ being they key connector. The size of keyword nodes on the map signifies the relative frequency (i.e., level of interest) of a topic discussed in the review documents. The positions, links, and proximity between keyword nodes visualize the ‘relatedness’ of topics studied in the literature. The largest node of Leadership had a frequency of 315 and digital transformation of 305. Leadership that leaders to digital transformation contributes to innovation (including) technological innovation, digitization, innovation and

technological development. The above discussion provides empirical evidence of the impact of leadership on digitalisation of business and need for digital skills among leaders. The term ‘Human’ emerged on the co-occurrence network as a key area of influencing indicating the leadership impact humans. Digital leadership is a newer keyword and very few papers indicating it as an emerging area of study.

5. Proposed Framework and Discussion

5.1 Skill Framework for digital leadership skills

To achieve the research objective of analysing digital leadership skills in the current business landscape and propose a skills framework required in tech-based ventures in leadership position, based on the TCCM literature review and the findings of Tigre et al., 2023 and Tigre et al., 2024 the following conceptual model for Digital Leadership skills for entrepreneurs in tech-based ventures is proposed :

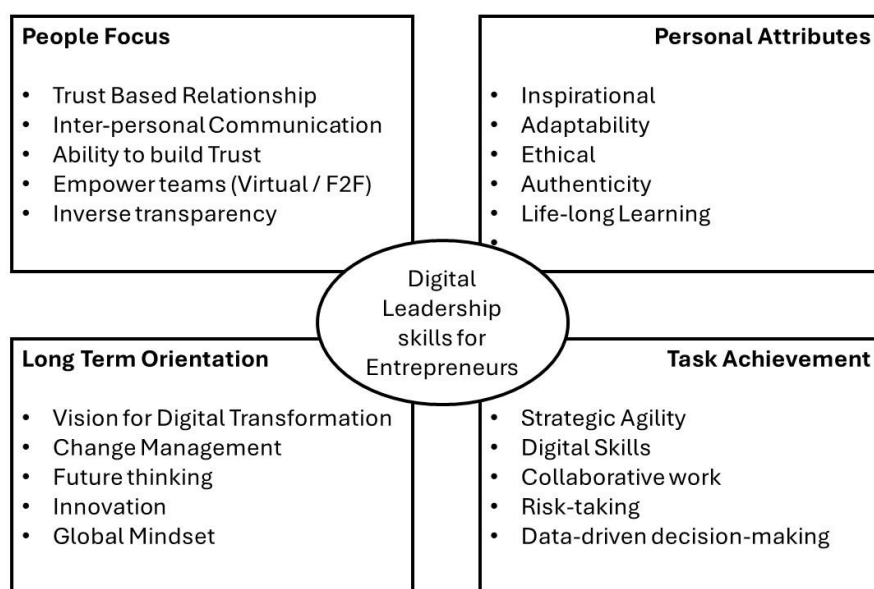


Figure 4 : Proposed Skill Framework for

To thrive in tech-driven ventures, entrepreneurs must develop strong digital leadership skills that balance people-centric strategies, personal growth, long-term vision, and task efficiency.

People Focus: Building trust-based relationships (AlNuaimi et al., 2022) and mastering interpersonal communication are essential for fostering collaboration in both virtual and face-to-face teams (Angelo and McCarthy, 2020; Gao et al., 2024). Leaders who promote empowerment (Gfrerer et al., 2021) and practice inverse transparency (Gierlich-Joas, 2020) sharing relevant information openly create inclusive environments that drive innovation and loyalty. (Tigre et al., 2023)

Personal Attributes: Successful digital leaders are inspirational, adaptable, and maintain a strong ethical foundation. Authenticity and a commitment to life-long learning enable them to navigate evolving technologies while staying true to their values, inspiring teams to follow their vision (Alkhoori et al., 2021; Tigre et al., 2024)

Long-Term Orientation: Visionary leaders embrace digital transformation (Imran et al., 2021; Horner-Long and Schoenberg, 2022) and excel in change management. By practicing future thinking, fostering innovation, and adopting a global mindset, they ensure their ventures remain competitive and sustainable in dynamic markets (Erhan et al., 2022; Tigre et al., 2024)

Task Achievement: Achieving goals in tech-based ventures requires strategic agility (Rosenbloom, 2000) , robust digital skills (Erhan et al., 2022), and a collaborative approach. Entrepreneurs who take calculated risks and make

data-driven decisions can pivot effectively, optimizing performance and driving growth Alkhoori et al., 2021; Tigre et al., 2023; Tigre et al., 2024).

5.2 Strategies to develop digital leadership skills among tech-based entrepreneurs:

Developing digital leadership skills among tech-based entrepreneurs is essential for navigating the complexities of the digital age. Entrepreneurs can cultivate digital skills by adopting a flexible approach to the environment, be responsive to change, enabling them to pivot strategies as needed. Developing and utilizing digital tools is crucial for effective decision-making and innovation is key to success. (Kaiyai et al., 2024). Engaging in reflective practices allows leaders to identify gaps in their skills and develop a personalized approach to learning (Bach, 2024). Adopting a Collaborative Learning by sharing experiences and insights with peers can enhance understanding and foster a shared vision within teams (Gao et al., 2024).

6. Conclusion

This study contributes to strategic management literature by bridging the existing gap in literature. Digital leadership specially in the context of entrepreneurship is emerging as an area of academic research. There is a need to empirically test frameworks in different context. In the context of tech-based startups in which the entrepreneurs use technology to add value to their customers and innovate. People-focus, skills for personal growth oriented, long-term orientation, and task efficiency are required. Leadership is key to digital transformation of business, innovate and manage change. Digital skills support leaders to leverage new technology. Identify skill gap by adopting by reflecting on the skills required and engaging in personalised learning can help entrepreneurs develop their digital skills. s

The review has identified many advances in the field of leadership and digital transformation of business. Our review calls for research to advance research on digital leadership skills in the current environment. It has re-established the relevant of transformational leadership in today's concept and the Upper Echelon theory that can be used for further research. Some of the strategies identified to develop digital literacy skills provide a road map to entrepreneur on how they can develop their skills to keep pace with the current digital transformation. The study provides a skill framework to leadership coaches for developing a digital leadership mindset. It offers Higher education intuitions (HEIs) a framework to Identify skill gap and develop personalised executive learning programs for entrepreneurs.

The study has some key limitations. Only Scopus data used for analysis, while many systematic reviews employ multiple databased. The TCCM was based on analysing relevant data from top 30 cites articles on Scopus and it could be that all relevant documents were not captured. The PRISMA framework was used for filtering relevant papers, but additional keyword combination could have yielded different set of results.

Future research could be carried out on a more comprehensive dataset by incorporating Scopus and web of science databased. Researchers could examine digital leadership skills for entrepreneurs considering perspectives from government policy, subjective norms and education for sustainability. Cultural factors could be considered while developing a more robust skill framework.

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