



WOA 2025

PESCARA

29-30 MAGGIO

WOA XXVI - WORKSHOP DEI DOCENTI E RICERCATORI DI
ORGANIZZAZIONE AZIENDALE

Università degli Studi d'Annunzio Chieti-Pescara Viale Pindaro Pescara

29 - 30 MAGGIO 2025

NAVIGATING ORGANIZATIONAL CHANGE
IN TIMES OF UNCERTAINTY

PIVOTING UNCERTAINTY WITH AI: DECISION-MAKING AND KNOWLEDGE MANAGEMENT FOR START-UPS IN INNOVATION ECOSYSTEMS

Short Paper

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Abstract

The integration of Artificial Intelligence (AI) into strategic decision-making processes is transforming the way organizations operate.

The paper explores how the startups of the the Rome Technopole innovative ecosystem integrate Artificial Intelligence into decision-making processes while upholding human-centric values and ethical standards.

This study aims to explore how the Knowledge Management (KM) framework can support strategic choices that derive from an effective and ethical integration of AI into decision-making processes, while ensuring the autonomy of decision-makers.

The methodology followed is qualitative-quantitative, based on the administration of semistructured interviews, the results of which are integrated with the analysis of the answers deriving from the sharing of an anonymous questionnaire.

Findings indicate that the adoption of AI guided by KM principles, combined with human skills, improves organizational adaptability, employee engagement, unlocks new growth opportunities, even under uncertainty and accelerates organizational learning cycles. The paper proposes a framework that balances AI and Human Intelligence.

Keywords: Artificial Intelligence, Knowledge Management, Strategic decision-making, Startup, Innovation Ecosystem

1 Introduction and research purpose

Integrating Artificial Intelligence (AI) into strategic decision-making processes is reshaping organizational operations, particularly within innovation ecosystems (Adner, 2017; Granstrand & Holgersson, 2020; DedeHayir et al. 2018), and in the era of Industry 5.0 (Carayannis et al., 2024), where agility and adaptability are essential.

Start-ups, often characterized by limited resources and high uncertainty, are increasingly experimenting with AI to gain competitive advantage and enhance knowledge-driven decisions. Start-ups active in innovation ecosystems can leverage AI to: i) analyze data sets and information, ii) identify market trends and iii) define competitive business strategies (Burström et al. 2021). AI support is strategic especially in the early years of startups, often characterized by uncertainty, resource constraints and high failure rates (Cantamessa et al., 2018); at the same time failures and constraints provide valuable learning experiences to access and/or develop new skills, abilities and outline innovative strategic orientations (Corvello et al., 2024). However, the integration of AI into decision-making and strategic processes

raises concerns about ethical compliance and the need to preserve the central role of human judgment in decision-making processes (Eapen et al., 2023).

Existing literature tends to focus either on large firms’ AI strategies or on the technical aspects of AI adoption, with limited attention to how early-stage enterprises ethically and strategically incorporate AI into their decision-making processes within ecosystem-based environments. Moreover, while Knowledge Management (KM) frameworks have been explored in relation to organizational learning and digital tools (Edwards et al., 2003; Venkitachalam & Willmott, 2015), their intersection with AI adoption in start-up ecosystems remains underdeveloped, especially as to how KM supports decisions that respect ethical values (Vaccaro, 2022). To address this gap, this paper examines how startups within the the Rome Technopole (RT)—a newly emerging, publicly supported innovation ecosystem—deploy AI in ways that balance technological potential with humancentric values and ethical considerations. The startups of the RT innovative ecosystem serve as a paradigmatic example of how the collaboration between AI and human decision-making capabilities can positively influence their strategies and evolutionary paths. It is therefore considered necessary to explore how the KM framework can effectively integrate AI in an ethical way, while ensuring the autonomy of decision-makers. This approach contributes to organizational research on the co-evolution of digital innovation and responsible management practices in complex, collaborative environments.

To meet this aim, the paper is structured as follows: i) definition of the theoretical background deriving from the analysis of the main theoretical contributions about Knowledge Management, AI and ethical implications; ii) quali-quantitative analysis of the strategic behavior of RT startups through the administration of semistructured interviews and questionnaire; and finally, iii) comparison of the main findings, limitations and future research directions.

2 Theoretical background

AI is a key factor in creating competitive advantages and supporting digital transformation (Krakowski et al. 2023), enhancing value generation (Porter & Kramer, 2018) and activating virtuous cycles of co-creation (Leone et al. 2021). It can improve decision-making processes (decision support), interactions with customers and employees, automation and the development of new products and services (Borges et al. 2021). The adoption of AI must be integrated with a business strategy that aligns technical resources, organizational processes and human skills (Chari et al. 2025; Gamboa, 2024; De Bem Machado et al. 2022), as shown in figure 1.

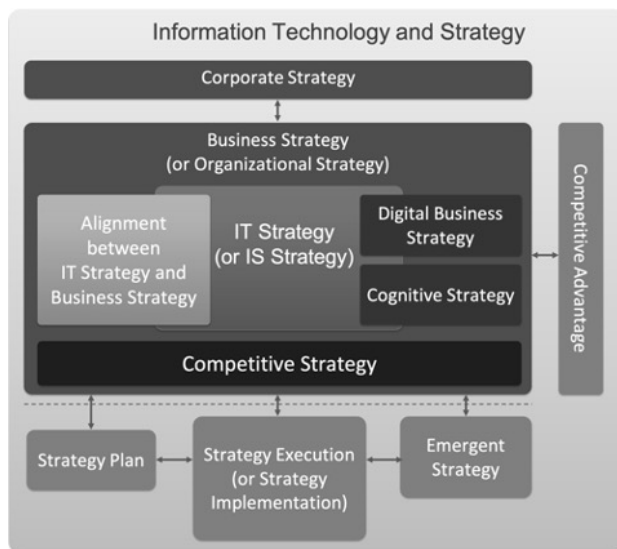


Figure 1. Integration between IT and strategy

Source: Borges et al. 2021

In Knowledge Management (KM) processes, AI accelerates the generation and dissemination of knowledge, especially thanks to generative AI (Oppioli et al., 2023), increasing decision-making accuracy (Nazeer et al., 2023). In addition, AI integrated into KM processes improves an organization's decision-making capabilities by making them more effective, accurate, and flexible (Duan et al., 2019; Metcalf et al., 2019). Leoni et al.'s (2024) framework shows how AI, KM and decision-making are interconnected: advanced tools automate and improve data analysis, supporting Human Intelligence (HI) without replacing it (Budhwar et al., 2022; Parasuraman et al., 2000).

The combination of AI and information-sharing systems drives sustainable performance improvements (Olan et al. 2022), including through knowledge warehouse architectures (Nemati et al. 2002) that capture and organize both explicit and tacit knowledge. Enabling factors include managerial commitment and agile organization, while cultural resistance, fears of replacing the human and low trust in automation hold back integration (Kar et al. 2021). Good human-AI interaction design supports managerial efficiency and responsibility (Shrestha et al. 2019), allowing for a productive “symbiosis” (Jarrahi et al., 2023). AI skills and HI collaboration increase dynamic capability (Chowdhury et al. 2022), offering competitive advantages and speed of response to changes. However, this requires in-depth ethical reflection (Rodgers et al. 2023), which puts the dignity of people at the center and favors fair and transparent processes (Varma et al. 2023). In summary, AI integrated synergistically with HI can support innovation, competitiveness and efficiency, as long as it is respectful of human and social values.

3 Methodology

The paper adopts a mixed-method approach combining qualitative and quantitative techniques. Primary data were collected through semistructured interviews with founders and decision-makers from seven startups operating within the RT ecosystem (Table 1).

Start-up	Sector	Core product or service
1	Health & Bio-pharma	Service for assessing the degree of reliability of research articles.
2	Digital transition	Digital platform for optimizing economic-financial reporting systems.
3	Energetic transition	Service for assessing the degree of sustainability (algorithm), including social and environmental, of tourism companies.
4	Digital transition	Management of coaching services, events, tournaments and E-sports team management.
5	Digital transition	Automation of collaborative projects.
6	Digital transition	Virtual assistance for tourism services.
7	Health & Bio-pharma	Research, development, marketing of phytoderivative products.

Table 1. Sample of interviewed startups

Source: own elaboration

The semistructured interview explored in depth the following thematic areas: human-centric and sustainable business models; support and collaboration within the RT; and AI-Based platform for the simulation of business models and possible future scenarios.

The qualitative study was also integrated with the evidence that emerged from the analysis of the responses to an anonymous questionnaire developed and promoted as part of the the Rome Technopole Observatory on AI project (he Rome Technopole, 2025). The questionnaire was distributed to participants and wider stakeholders involved in the RT. In this paper, exclusive reference is made to the sample of respondents (32) who fall within the target of innovative startups and SMEs. The questionnaire covered a wide range of topics related to AI, digital transformation, and organizational readiness. Evidence on ethical and KM aspects, on the other hand, was deduced from the observation of

the selected case studies. The triangulation of methods enriches our understanding of emerging patterns in AI-enabled decision-making and knowledge practices.

3.1 The Rome Technopole (RT) emergent Innovation Ecosystem

The RT project aims to create an innovation ecosystem (Adner, 2017) in Lazio, funded by the PNRR 2021-2027, which integrates research, technology transfer and education. A hub and spoke system (Dedehayir et al., 2018) connects Universities, Research Centers, Companies, Institutions and Associations and Start-ups (Freeman, 2023), forming a dynamic system of collaboration and competition (Bacon, Williams & Davies, 2020). The aim is to promote the creation of shared value (Porter & Kramer, 2018) and to promote advanced research on energy, digital, health and human-centred AI transition. Synergies between actors manifest themselves in strategic projects and activities (research, education, technology transfer and community involvement), supporting continuous innovation (Granstrand & Holgersson, 2020) and organisational learning (Valkokari et al., 2016). Competitive advantages come from economies of scale, reduced risk, fast market access and sustainable growth. RT intends to evolve over time by co-creating development opportunities and positioning itself as a national and European reference for innovation (Chandler, 2022), balancing the use of AI technologies with the needs of social responsibility.

4 Findings and discussion

Our findings reveal that startups are in the early stages of AI adoption, with heterogeneous infrastructures (cloud, hybrid, on-premise) and mostly partially structured decision-making procedures. Many are experimenting with AI integration, using machine learning platforms for future scenarios simulation, evaluating business models, monitoring cash flows and assigning sustainability scores (e.g., 0-100), and automating strategic and operational processes thanks to algorithms registered as intellectual property. This combined approach (AI and HI) is made possible by mentorship, periodic meetings and constant feedback. Despite limited internal capabilities, the use of frameworks like the SDGs and ESG standards reflects a strategic commitment to sustainability, though they require organizational investments to fully exploit the potential of AI.

In particular, 20 out of 32 startups do not yet have specialized teams, while only 8 already have one and 4 plan to create one. The number of projects carried out also appears limited (mainly between 1 and 5), showing significant growth margins. Most firms rely on external mentorship and collaboration rather than internal AI teams, highlighting a need for organizational development. Overall, although startups demonstrate a propensity for AI innovation, internal structure and skills remain to be strengthened to move from an experimental phase to full technological integration. The data suggest a transition phase where AI is valued but not yet structurally embedded. This calls for investments in skills, governance, and ethical AI practices.

5 Conclusion and future research directions

AI significantly enhances decision-making and knowledge management among startups in innovation ecosystems, optimizing IT investments and strategies. Acting as a strategic lever, AI supports the automation of processes and the extraction of new knowledge from big data, fostering a competitive advantage. Although the integration of AI in RT startups is still in its infancy and characterized by heterogeneity, it enhances the synergy between technology and human skills, through an ethical and sustainable lens that requires further investment and dedicated teams.

The proposed models provide a framework for integrating AI and knowledge management, strengthening decision-making and triggering a virtuous cycle of learning. Technological innovation should not be seen as an end in itself, but is intertwined with values of responsibility and sustainability, in which the human-centric approach and data protection support ethical and transparent choices. In this context, entrepreneurs and managers should invest in staff training and organizational interventions, so as to fully exploit the potential of responsible human-AI integration. However, ethical integration,

organizational investments, and human-centric frameworks are essential for sustainable value creation. The the Rome Technopole context shows promising synergies between AI and human judgment, though greater structural capacity is needed.

The findings emphasize the importance of aligning technological tools with values of responsibility, transparency, and learning to foster enduring innovation. This paper contributes to the understanding of digital transformation in start-up ecosystems by linking AI adoption to ethical knowledge management and decision-making processes. It highlights the strategic potential of human-AI collaboration and identifies barriers and enablers relevant to early-stage companies. The work bridges theoretical insights with practical implications for innovation governance under uncertainty.

The paper contributes in terms of the impact of digital transformation and AI on organizational change processes, highlighting how the combination of advanced technologies and human skills can generate adaptability, employee engagement and new growth opportunities even in conditions of uncertainty.

The study is limited by its sample size and the nascent stage of AI integration among the observed startups. As many applications remain experimental, restricting a full assessment of long-term impacts. Further research is needed to validate their benefits and study the interaction between AI and knowledge management. It would also be useful to extend the analysis to innovative SMEs and startups that are sustainable from an economic, social, environmental and ethical point of view, so as to overcome strategic, organisational, cultural and financial barriers in the digital transition. A comparative approach across regional ecosystems would offer insights into how different innovation contexts influence AI adoption trajectories and KM effectiveness.

6 Disclaimer

This research has been partially funded by the ecosystem project the Rome Technopole – CUP B83D21014170006.

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