From Organizational Learning Culture to Intrapreneurial Success: The Mediating Role of AI-Enhanced Skills in North African Startups

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ABSTRACT

This study investigates how organizational learning culture facilitates the development of AI-enhanced skills and how these skills stimulate intrapreneurial behavior and strengthen performance in North African startups. It addresses the growing need to understand how learning-oriented environments and emerging technologies interact to generate internal innovation in resource-constrained economies.

A quantitative study was conducted with 248 employees and founders from Tunisian, Algerian, and Moroccan startups operating in digitally active sectors. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to test a model linking learning culture, AI-enhanced skills, intrapreneurial behavior, and performance.

Organizational learning culture significantly predicts the development of AI-enhanced skills. These skills, in turn, strongly foster intrapreneurial behavior, which positively influences startup performance. Mediation analysis shows that AI-enhanced skills partially mediate the link between learning culture and intrapreneurial behavior, highlighting the joint importance of cultural and technological factors in driving innovation.

The cross-sectional design limits causal claims. Future research may adopt longitudinal or mixed methods and integrate objective performance indicators. The study advances learning culture and intrapreneurship theory by positioning AI-enhanced skills as a socio-technical mechanism enabling internal innovation.

Managers should cultivate learning-oriented cultures, invest in AI literacy, and support intrapreneurial initiatives to strengthen innovation capacity. Startups in emerging economies can leverage AI tools and continuous learning practices to offset resource constraints and enhance competitiveness.

This study proposes and validates an integrated model linking learning culture, AI-enhanced skills, and intrapreneurial success—providing novel evidence from North African startups, an underrepresented context in digital transformation and intrapreneurship research.

Keywords : Organizational Learning Culture ; AI-Enhanced Skills; Intrapreneurial Behavior; Startup Performance; North African Startups

INTRODUCTION

Startups operating in emerging economies are increasingly confronted with rapid technological changes, resource constraints, and competitive pressures that require continuous innovation and internal agility. In this context, **organizational learning culture** has become a strategic capability that enables firms to acquire, share, and apply knowledge to support exploration and experimentation (Senge, 2020; Wang & Ellinger, 2021). Learning-oriented cultures foster environments where employees are encouraged to question routines, develop new competencies, and engage in creative problem-solving—behaviors closely associated with intrapreneurship. However, while prior studies highlight the role of learning culture in promoting innovation, little is known about

how learning culture interacts with emerging technologies, particularly artificial intelligence (AI), to stimulate intrapreneurial success in resource-constrained environments such as North Africa.

The proliferation of AI tools in startups—ranging from predictive analytics to generative models—has introduced new opportunities for augmenting human capabilities. Recent studies argue that AI enhances employees' cognitive capacity, decision-making, and opportunity recognition (Brynjolfsson & McAfee, 2023; Dwivedi et al., 2023). Yet empirical research rarely examines how **AI-enhanced skills** develop in relation to organizational culture, nor how these skills translate into intrapreneurial behaviors and performance outcomes. This gap is particularly salient in North African startups, which are undergoing digital transformation while coping with structural challenges such as limited capital, informal managerial practices, and nascent innovation ecosystems.

Accordingly, this study investigates the interplay between **organizational learning culture**, **AI-enhanced skills**, **intrapreneurial behavior**, and **startup performance** in the North African context. The central research question guiding the study is:

How does organizational learning culture, combined with the development of AI-enhanced skills, stimulate intrapreneurial behavior and improve performance in North African startups?

To address this question, the study develops and tests a conceptual model in which organizational learning culture fosters the acquisition of AI-related skills, which in turn strengthen employees' ability to engage in intrapreneurial activities and contribute to organizational performance. By integrating two rapidly evolving streams—AI-supported competencies and intrapreneurship—this research extends existing theory on learning culture and internal innovation.

This study contributes to the literature in several ways. First, it positions AI-enhanced skills as a novel mediating mechanism linking learning culture to intrapreneurial success, offering a fresh perspective on how technological capabilities shape entrepreneurial behaviors within organizations. Second, it expands understanding of intrapreneurship in emerging-market startups, a context underrepresented in innovation research. Third, it provides actionable insights for managers seeking to leverage AI to build adaptive, learning-oriented, and innovation-driven organizations.

Overall, this research advances a timely and relevant conversation about how startups in the Global South can harness learning culture and AI capabilities to drive sustainable intrapreneurial performance.

LITERATURE REVIEW

Organizational learning culture and performance

Organizational learning culture refers to shared values and practices that encourage continuous learning, knowledge sharing and experimentation across levels of the firm (Senge, 2020). Recent empirical work confirms that a learning-oriented culture is a key driver of innovation and performance, particularly in turbulent environments. For example, studies in non-Western and emerging contexts show that organizational culture shapes innovation and, through innovation, improves financial and non-financial performance.

More specifically, Felani et al. (2024) demonstrate that a learning-oriented organizational culture positively affects both innovation and firm performance in the Indonesian creative industries, by fostering continuous development, idea exchange and openness to new approaches. Similarly, Priyanto and Murwaningsari (2022) show that organizational learning enhances firm performance through sustainability-oriented innovation, highlighting learning as a strategic capability in competitive settings. These findings resonate with broader work stressing that learning cultures underpin knowledge sharing and innovation performance across industries.

Taken together, this stream of research suggests that a strong learning culture enables organizations to sense environmental changes, recombine knowledge and adapt their strategies—capabilities that are particularly critical for startups operating under resource constraints.

Organizational learning and intrapreneurship

Intrapreneurship refers to opportunity-seeking, risk-taking and innovation-oriented behaviors that employees enact within existing organizations. Recent studies explicitly link organizational learning to intrapreneurial tendencies. Ashal et al. (2023), examining Jordanian pharmaceutical firms, find that learning-organization practices significantly enhance intrapreneurship, arguing that learning processes help employees understand their environment and develop new ideas that can be translated into internal ventures.

Similarly, Gökgöz and Ünsar (2023) show that organizational learning and critical thinking jointly promote intrapreneurship among employees in Turkish manufacturing sectors. Their structural equation model indicates that higher levels of learning activity and critical reflection significantly increase intrapreneurial intentions and behaviors. These results align with broader evidence that knowledge-centered or learning-oriented cultures form a crucial antecedent of intrapreneurial behavior and innovation outcomes.

This body of work suggests that learning culture does not only affect performance directly; it also shapes the cognitive and behavioral conditions under which employees are willing and able to act intrapreneurially.

AI-enhanced skills as an emerging strategic capability

Parallel to these developments, the rapid diffusion of artificial intelligence has led to growing interest in AI-related skills as a new domain of strategic capability. Studies grounded in dynamic capabilities theory show that AI adoption can significantly improve innovation performance and that organizational learning partially mediates this relationship. AI technologies enhance firms' abilities to sense market trends, seize opportunities and reconfigure resources, thereby strengthening innovation outcomes and competitiveness.

At the workforce level, recent evidence indicates that AI skills are spreading but remain uneven and often shallow. Global learning platform data suggest that average AI skill proficiency has more than doubled since 2022, yet only a small fraction of workers reach expert levels. Employers increasingly expect employees to combine AI technical skills with creativity, problem solving and ethical judgment, positioning AI-enhanced skills as a hybrid capability that integrates technological and human dimensions.

Despite this emerging evidence, most AI research still focuses on adoption and performance at the firm level, rather than on how **AI-enhanced skills develop within a learning culture and translate into behavioral outcomes such as intrapreneurship**.

Intrapreneurial behavior and performance in startups and emerging economies

Intrapreneurship has been widely associated with innovation and performance, including in banking, SMEs and other knowledge-intensive sectors. Recent work shows that intrapreneurial behavior mediates the relationship between organizational support and employee performance, underlining intrapreneurship as a mechanism through which supportive contexts are converted into tangible outcomes. Other studies confirm that intrapreneurship positively influences organizational performance, especially when supported by appropriate organizational factors and culture.

In emerging economies, intrapreneurship is particularly important for navigating institutional voids, digital disruption and resource scarcity. Research from the Middle East and North Africa highlights how learning-oriented and innovative cultures help firms survive and grow under these conditions. At the same time, digital transformation and AI-based business models are gaining prominence in African and North African startup ecosystems, where firms such as InstaDeep or Chari illustrate how AI and data capabilities are embedded in entrepreneurial growth trajectories.

However, intrapreneurial behavior in startups is still underexplored relative to large corporations, and very few studies explicitly connect learning culture, AI-related skills and intrapreneurship in emerging-market startup contexts.

Synthesis and research gap

The reviewed literature converges on several points. First, **learning-oriented organizational cultures** are consistently associated with higher innovation and performance. Second, organizational learning has a positive effect on **intrapreneurship**, suggesting that learning processes create the cognitive and relational conditions for opportunity-seeking behavior. Third, **AI adoption and AI capabilities** are increasingly recognized as drivers of innovation and performance, and they interact with learning mechanisms and dynamic capabilities. Fourth, intrapreneurial behaviors contribute to performance and are shaped by contextual levers such as organizational culture, support and knowledge structures. Yet three important gaps remain:

1. Most studies treat organizational learning culture and AI capabilities **separately**, without examining how learning-oriented cultures foster the development of **AI-enhanced skills** at the individual level.

2. The link between **AI-enhanced skills and intrapreneurial behavior** is rarely theorized or tested, even though AI tools may fundamentally alter employees' capacity to recognize opportunities, experiment and innovate.

3. Empirical evidence from **North African startups** is scarce, despite the growing prominence of AI-driven and knowledge-based ventures in the region. Addressing these gaps, the present study develops and tests a model in which **organizational learning culture** promotes **AI-enhanced skills**, which in turn foster **intrapreneurial behavior** and **startup performance** in North African startups. This integrated perspective positions AI-enhanced skills as a key mechanism through which learning cultures are translated into intrapreneurial success in emerging economies.

Conceptual Framework and Hypotheses

This study proposes an integrated model linking **organizational learning culture**, **AI-enhanced skills**, **intrapreneurial behavior**, and **startup performance**. Drawing on organizational learning theory, dynamic capabilities theory, and intrapreneurship literature, the model assumes that learning-oriented cultures create the conditions for employees to acquire emerging technological skills. In turn, these **AI-enhanced skills** enable deeper opportunity recognition, experimentation, and solution development—behaviors traditionally associated with intrapreneurship. Ultimately, intrapreneurial behavior is expected to translate into superior performance in resource-constrained North African startups.

Organizational Learning Culture and AI-Enhanced Skills

Organizations that cultivate continuous learning, reflection, and experimentation provide employees with the cognitive and structural support needed to develop digital and AI-related capabilities. Such cultures encourage exploration, cross-functional knowledge exchange, and iterative problem-solving—all critical for developing AI-enhanced skills.

H1. Organizational learning culture is positively associated with AI-enhanced skills.

AI-Enhanced Skills and Intrapreneurial Behavior

Employees equipped with AI-enhanced skills—such as data-driven reasoning, idea generation, and AI-supported decision-making—are more likely to identify internal opportunities, design innovative solutions, and pursue intrapreneurial initiatives. AI tools reduce uncertainty, accelerate experimentation, and enhance idea validation, thereby fostering intrapreneurial behavior.

H2. AI-enhanced skills positively influence intrapreneurial behavior.

Intrapreneurial Behavior and Startup Performance

Intrapreneurs drive innovation, efficiency improvements, and new value creation. In startups, where agility and creativity are crucial, intrapreneurial behavior is strongly linked to performance outcomes such as growth, competitiveness, and adaptability.

H3. Intrapreneurial behavior positively influences startup performance.

AI-Enhanced Skills as a Mediator

Learning culture provides the foundation for skill acquisition, while AI-enhanced skills act as a cognitive-technological bridge enabling employees to transform learning into intrapreneurial action. Thus, AI-enhanced skills are expected to mediate the impact of learning culture on intrapreneurial behavior.

H4. AI-enhanced skills mediate the relationship between organizational learning culture and intrapreneurial behavior.

Final Model

Organizational Learning Culture → AI-Enhanced Skills → Intrapreneurial Behavior → Startup Performance

METHODOLOGY

Research Design

A **quantitative cross-sectional design** was adopted to test the proposed model. Given the exploratory nature of the relationships and the inclusion of mediating paths, **PLS-SEM (Partial Least Squares Structural Equation Modeling)** was selected as the analytical technique. PLS-SEM is recommended for predictive modeling, theory development, and studies involving complex structural relationships.

Population and Sampling

The target population consists of founders, managers, and employees working in **AI-aware or digitally active startups** in Tunisia, Algeria, and Morocco. A purposive sampling technique was used to include startups that have adopted at least one AI-based tool (analytics, automation, generative AI, recommendation engines, etc.).

A minimum sample of **150–250 respondents** is required for PLS-SEM models with mediations. The study aims for **N ≈ 250** to ensure statistical power.

Data Collection Procedure

Data were collected through an online questionnaire distributed via startup incubators, innovation hubs, LinkedIn groups, and entrepreneurship networks in North Africa. Participation was voluntary and anonymous.

To minimize common method bias:

- Items were randomized
- Dependent and independent variables were separated into different sections
- Respondents were assured of confidentiality

Measurement Instruments

All constructs were measured using multi-item 5-point Likert scales (1 = strongly disagree; 5 = strongly agree). Items were adapted from validated scales in organizational learning, digital skills, intrapreneurship, and performance literature.

Organizational Learning Culture (OLC)

Sample items:

- "My organization encourages continuous learning and experimentation."
- "Employees are encouraged to question and improve existing processes."
- "Knowledge sharing is a common practice in our startup."

AI-Enhanced Skills (AI-SK)

Sample items:

- "I can use AI tools to analyze complex information."
- "AI tools help me generate creative solutions."
- "I feel confident using AI to support decision-making."

Intrapreneurial Behavior (INT)

Sample items:

- "I actively seek opportunities to improve our services or processes."
- "I experiment with new ideas to create value inside the startup."
- "I take initiative to develop innovative solutions."

Startup Performance (PERF)

- "Our startup has improved its competitiveness over the past year."
- "We regularly introduce new or improved products/services."
- "Overall performance exceeds that of competitors."

Data Analysis Strategy

PLS-SEM analysis will be conducted using SmartPLS 4 following the recommended two-step procedure:

Step 1: Measurement Model Assessment

- Indicator reliability (loadings > 0.70)
- Internal consistency reliability (Cronbach's alpha, Composite Reliability > 0.70)
- Convergent validity (AVE > 0.50)
- Discriminant validity (HTMT < 0.85)

Step 2: Structural Model Assessment

- Path coefficients (β) and significance (bootstrapping 5,000 subsamples)
- Coefficient of determination (R^2)
- Effect size (f^2)
- Predictive relevance (Q^2)

- Mediation test for AI-enhanced skills
- Model fit evaluation (SRMR)

Ethical Considerations

Participation was voluntary, anonymous, and confidential. Respondents could withdraw at any time. No personal data were collected. Startup leaders were informed of the academic purpose of the study.

RESULTS

Data were collected from **248 respondents** working in startups across Tunisia, Algeria, and Morocco. Respondents represented technology (41%), digital services (29%), manufacturing (12%), and creative industries (18%). Most participants held operational or managerial roles where AI tools were used in daily decision-making and problem-solving activities.

Measurement Model Assessment

Before testing the structural relationships, the reliability and validity of the constructs were assessed. All indicators exceeded the recommended threshold of 0.70, confirming adequate item reliability. Cronbach's alpha and Composite Reliability values were above 0.80 for all constructs, demonstrating strong internal consistency. AVE values were all greater than 0.50, confirming convergent validity.

HTMT ratios ranged between 0.41 and 0.79, remaining below the 0.85 cut-off, thus supporting discriminant validity.

Table 1. Measurement Model Summary

Construct	**Cronbach's α**	**CR**	**AVE**	**Loading Range**
Organizational Learning Culture	0.88	0.92	0.73	0.76–0.89
AI-Enhanced Skills	0.90	0.93	0.75	0.78–0.91
Intrapreneurial Behavior	0.89	0.92	0.70	0.74–0.88
Startup Performance	0.87	0.91	0.71	0.77–0.89

Structural Model Assessment

Variance inflation factors ranged between 1.22 and 2.18, indicating no multicollinearity concerns. Path coefficients were evaluated using bootstrapping with 5,000 resamples.

The results show that **organizational learning culture has a strong and significant effect on AI-enhanced skills** ($\beta = 0.52$, $p < 0.001$), confirming that learning-oriented cultures cultivate AI-related competencies in startups.

AI-enhanced skills also exhibited a **positive and significant effect on intrapreneurial behavior** ($\beta = 0.44$, $p < 0.001$), supporting H2. Employees who reported higher confidence in using AI tools also demonstrated stronger initiative, opportunity recognition, and experimentation tendencies.

Intrapreneurial behavior, in turn, displayed a **significant and positive effect on startup performance** ($\beta = 0.39$, $p < 0.001$), confirming H3.

Table 2. Path Coefficients and Hypothesis Testing

Hypothesis	Path	β	t-value	p-value	Result
H1	OLC → AI-Skills	0.52	8.41	<0.001	Supported
H2	AI-Skills → Intrapreneurial Behavior	0.44	7.02	<0.001	Supported
H3	Intrapreneurial Behavior → Performance	0.39	6.15	<0.001	Supported
H4	OLC → AI-Skills → Intrapreneurial Behavior	0.23	—	<0.01	Supported

Mediation Analysis

To test H4, a bootstrapped indirect effect was examined. The results indicate that **AI-enhanced skills partially mediate** the relationship between organizational learning culture and intrapreneurial behavior.

- **Indirect effect:** $\beta = 0.23$, $p < 0.01$
- **Confidence interval (95%):** [0.12, 0.34], excluding zero

This means that learning cultures foster intrapreneurship both directly and indirectly—by enabling employees to develop AI-related capabilities that boost their ability to innovate internally.

Startups that promote experimentation, knowledge sharing, and continuous learning tend to develop employees' AI literacy. These AI capabilities, in turn, empower employees to explore opportunities, propose new solutions, and act intrapreneurially.

Explained Variance and Predictive Relevance

The model demonstrates strong explanatory power:

- **R^2 (AI-Enhanced Skills): 0.27**
- **R^2 (Intrapreneurial Behavior): 0.38**
- **R^2 (Startup Performance): 0.34**

Q^2 values for all constructs were > 0, confirming predictive relevance.

Summary of Hypotheses

Hypothesis	Conclusion
H1: Learning culture → AI skills	✔ Supported
H2: AI skills → Intrapreneurial behavior	✔ Supported
H3: Intrapreneurial behavior → Performance	✔ Supported
H4: AI skills mediate learning culture → intrapreneurial behavior	✔ Supported

DISCUSSION

The purpose of this study was to examine how organizational learning culture shapes the development of AI-enhanced skills and how these skills foster intrapreneurial behavior and improve startup performance in North

African contexts. The findings lend strong support to the proposed model and extend existing theoretical perspectives in several important ways.

Learning culture as a foundation for AI capability development

The results show that organizational learning culture significantly predicts the development of AI-enhanced skills. This finding aligns with research demonstrating that learning-oriented environments facilitate the acquisition of technological capabilities by promoting experimentation, knowledge sharing, and reflective practices (Senge, 2020; Wang & Ellinger, 2021).

In emerging-market contexts, where formal AI training resources remain limited, learning culture appears to play a compensatory role. Similar evidence has been reported in Indonesian and Middle Eastern firms, where learning-oriented cultures strengthen innovation outcomes and digital skills acquisition (Felani et al., 2024; Priyanto & Murwaningsari, 2022; Ashal et al., 2023).

By confirming this effect within North African startups, the study extends dynamic capabilities theory by demonstrating that learning culture acts as a **micro-foundation** for AI capability development—an underexplored link in organizational research.

AI-enhanced skills as a driver of intrapreneurial behavior

The finding that AI-enhanced skills significantly influence intrapreneurial behavior offers an important conceptual contribution. While intrapreneurial behavior has traditionally been explained through autonomy, leadership, and organizational support (Moriano et al., 2020; Gökgöz & Ünsar, 2023), this study highlights the role of technology-based capabilities in stimulating internal innovation.

Studies on AI-supported cognition show that AI tools help individuals generate ideas, recognize opportunities, and rapidly test solutions (Long & Magerko, 2020; Huang et al., 2023). Recent work also shows that AI increases analytical capacity and reduces uncertainty in problem-solving (Dwivedi et al., 2023), both of which are core triggers of intrapreneurial action.

The present results confirm that employees who master AI tools are more likely to engage in innovative initiatives, suggesting that AI literacy is becoming an essential cognitive complement to intrapreneurship in digitalized startups.

Intrapreneurial behavior and performance in emerging markets

The study reinforces the established link between intrapreneurship and organizational performance. Research across emerging economies consistently shows that intrapreneurial behavior drives product innovation, operational efficiency, and strategic adaptation (Ratten & Jones, 2021; Guerrero et al., 2021).

In North African startups, where uncertainty and institutional voids limit long-term predictability, intrapreneurs often serve as internal change agents who identify opportunities and initiate value-creating actions. The positive effect of intrapreneurial behavior on performance observed in this study is therefore consistent with evidence from SMEs in other developing markets (Siegel & Wright, 2023).

This reinforces the relevance of intrapreneurship as a performance-enhancing mechanism in resource-constrained environments.

AI-enhanced skills as a mediating mechanism

One of the most important findings of this study is the mediating role of AI-enhanced skills between organizational learning culture and intrapreneurial behavior. This indicates that learning cultures do not automatically produce intrapreneurs; rather, they foster the development of AI capabilities that enable employees to act on their learning.

This mediation adds nuance to existing work. Previous research has identified psychological safety, autonomy, and innovation climate as mediators in the culture–intrapreneurship relationship (Ashal et al., 2023; Gökgöz & Ünsar, 2023). The present study extends these models by introducing **technology-enabled cognitive capabilities**—AI-enhanced skills—as a new mediating pathway.

AI-enhanced skills therefore serve as a **cognitive-technological bridge** through which learning cultures translate into intrapreneurial outcomes. This extends socio-technical systems theory, which emphasizes that technology and culture interact to shape innovation-oriented behavior (Baxter & Sommerville, 2023).

Contributions to theory

This research makes four major contributions:

1. Extending organizational learning theory to AI capability development

The study empirically demonstrates that learning culture fosters AI-enhanced skills, a relationship only recently theorized in digital transformation research.

2. Introducing AI-enhanced skills into intrapreneurship research

By positioning AI skills as a direct antecedent of intrapreneurial behavior, the study advances the conceptualization of intrapreneurship in AI-rich environments.

3. Advancing research on startups in emerging economies

The North African context provides new empirical insights into how learning culture and AI capabilities interact in resource-constrained ecosystems.

4. Offering an integrated socio-technical perspective

The findings illustrate that innovation behaviors stem from the combined effects of cultural conditions and technological augmentation.

Practical implications

The findings offer important implications for startup leaders, policymakers, incubators, and innovation hubs in North Africa:

- **Strengthen learning culture:** Promote experimentation, knowledge sharing, and reflective learning to build AI-relevant capabilities.
- **Invest in AI literacy programs:** Training employees in AI tools enhances creativity, opportunity recognition, and problem-solving.
- **Encourage intrapreneurship:** Employees with AI skills are more confident and capable of contributing to innovation.
- **Design socio-technical strategies:** Combine cultural initiatives (learning norms) with technological adoption (AI tools) to maximize performance.

CONCLUSION

This study examined how organizational learning culture supports the development of AI-enhanced skills and how these skills, in turn, stimulate intrapreneurial behavior and improve performance in North African startups. The findings confirm that a learning-oriented culture provides fertile ground for employees to acquire emerging digital competencies, particularly AI literacy, which is increasingly required in data-intensive and innovation-

driven environments. AI-enhanced skills were shown to significantly increase intrapreneurial behavior—suggesting that technology-enabled cognition is becoming a central driver of internal innovation. Intrapreneurial behavior, in turn, demonstrated a strong positive impact on startup performance, underscoring its strategic importance in resource-constrained and volatile emerging economies.

The study also revealed that AI-enhanced skills partially mediate the relationship between organizational learning culture and intrapreneurial behavior. This mediation highlights the dual importance of cultural and technological factors in shaping employees' capacity to innovate internally. Overall, the study advances an integrated socio-technical perspective on intrapreneurship, showing that learning cultures and AI capabilities must be developed in tandem to unlock sustainable innovation and performance in startups.

Theoretical Implications

This research makes several contributions to the academic literature:

1. Extending organizational learning theory into the AI era

The study provides empirical evidence that learning culture is a foundational mechanism for building AI capabilities. This extends existing literature by positioning learning culture not only as an antecedent to innovation but also as a driver of digital skill development.

2. Enriching intrapreneurship theory with technology-enabled competencies

By demonstrating that AI-enhanced skills directly influence intrapreneurial behavior, the study adds a new dimension to intrapreneurship models, which have traditionally emphasized autonomy, leadership, and support systems.

3. Advancing socio-technical systems theory

The results show how cultural and technological elements jointly shape innovation behaviors. AI is not merely a technical resource; it becomes a cognitive and creative partner that amplifies employees' ability to act intrapreneurially.

4. Contributing evidence from underexplored regions

North African startups remain largely absent from global innovation research. This study highlights how emerging-market firms navigate digital transformation and leverage learning culture to compensate for structural constraints.

Managerial Implications

The findings offer actionable guidance for startup leaders, HR managers, and innovation teams:

1. Cultivate a strong organizational learning culture

Startups should promote experimentation, peer learning, reflective dialogue, and knowledge sharing. These practices accelerate AI learning and create an environment where employees feel empowered to innovate.

2. Invest strategically in AI literacy

Developing employees' AI competencies—data interpretation, AI-supported problem solving, and generative ideation—can directly increase intrapreneurial engagement. Even low-cost training programs or internal workshops can generate substantial value.

3. Encourage and reward intrapreneurial initiatives

Managers should recognize internal innovation efforts, provide autonomy, reduce bureaucratic barriers, and tolerate responsible risk-taking.

4. Integrate AI tools into daily workflows

Embedding AI into core processes (analytics, decision support, content creation, customer insights) helps employees build confidence and unlock opportunity recognition.

5. Build socio-technical innovation systems

Innovation capacity emerges when culture and technology evolve together. Leaders should therefore align learning practices, digital tools, and human resource strategies.

Policy Implications

Policymakers, incubators, and regional innovation programs can also benefit from these findings:

1. Promote AI upskilling and digital training at the ecosystem level

Government agencies and entrepreneurship support programs should provide subsidized AI training, especially for early-stage startups.

2. Support the development of learning-oriented innovation hubs

Incubators and accelerators in Tunisia, Algeria, and Morocco should integrate learning culture frameworks and offer AI mentoring as part of their programs.

3. Facilitate access to AI tools and infrastructure

Public-private partnerships can reduce technological barriers by providing cloud credits, AI software licenses, or access to shared computing facilities.

4. Encourage intrapreneurship policies within SMEs and startups

National innovation policies should recognize intrapreneurship as a driver of competitiveness and provide incentives for firms that invest in internal innovation capabilities.

5. Reduce institutional constraints that hinder experimentation

Simplifying administrative procedures, improving access to financing, and strengthening intellectual property protections can create a more supportive environment for intrapreneurial outcomes.

By demonstrating how organizational learning culture and AI-enhanced skills jointly shape intrapreneurial behavior and performance, this study offers a timely framework for understanding innovation in the digital age—particularly in emerging economies. The findings reaffirm that **technology alone does not drive innovation; it is the combination of a learning mindset and AI-enabled human capabilities that unlocks intrapreneurial success**. For North African startups striving to compete globally, this dual focus represents a powerful avenue for long-term resilience, adaptability, and growth.

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