

Developing a Knowledge Management Model for Intergenerational Entrepreneurs in Science and Technology Parks

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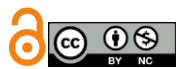
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ABSTRACT

Objective: This study aimed to develop a comprehensive knowledge management model for intergenerational entrepreneurs operating within science and technology parks.

Methods and Materials: This applied study employed a qualitative and exploratory design using thematic analysis. The participants consisted of experts in knowledge management, entrepreneurship, innovation, science and technology parks, and knowledge-based firms. Participants were selected through purposive sampling based on relevant academic expertise and executive experience. Data were collected through in-depth semi-structured interviews conducted face-to-face and online. Interviews lasted approximately 45–90 minutes and continued until theoretical saturation was achieved with 16 participants. All interviews were transcribed verbatim and analyzed through repeated reading, extraction of meaning units, coding, classification of basic codes into constituent codes, and identification of organizing and overarching themes. Credibility was enhanced through expert participant selection, diversity of perspectives, systematic data analysis, complete transcription, and continuation of data collection until theoretical saturation.

Findings: The thematic analysis identified eight overarching dimensions of intergenerational entrepreneurs' knowledge management: human and relational foundations of intergenerational knowledge management; knowledge-oriented and innovative organizational culture; knowledge leadership and governance in the entrepreneurial ecosystem; management and transfer of entrepreneurs' experiential knowledge; structural and network infrastructures for knowledge management; intergenerational synergy in innovation and technology development; a smart ecosystem for learning and innovation; and barriers and challenges to intergenerational knowledge management. The findings demonstrated that effective intergenerational knowledge management depends on reciprocal learning, intergenerational trust, knowledge sharing, supportive leadership, tacit knowledge transfer, experience documentation, flexible organizational structures, knowledge networking, integration of managerial experience

with technological expertise, and digital knowledge management. Conversely, unhealthy competition, knowledge hiding, generational conflict, and resistance to change were identified as major barriers.

Conclusion: Intergenerational knowledge management in science and technology parks is a multidimensional and ecosystem-based process in which relational, cultural, managerial, structural, technological, and experiential mechanisms interact. The proposed model suggests that sustainable innovation can be strengthened by integrating the accumulated managerial experience of older entrepreneurs with the technological agility and creativity of younger generations while simultaneously reducing barriers to knowledge sharing.

Keywords: *Knowledge Management, Intergenerational Entrepreneurs, Science and Technology Parks, Knowledge Transfer, Entrepreneurial Ecosystem, Innovation, Intergenerational Learning*

1 Introduction

In contemporary knowledge-based economies, knowledge is increasingly regarded as one of the most strategically important resources for organizational survival, competitiveness, innovation, and sustainable development. Unlike traditional tangible resources, knowledge is dynamic, accumulative, context-dependent, and closely embedded in individuals, relationships, organizational routines, and institutional networks. Consequently, organizations that can systematically create, acquire, share, retain, integrate, and apply knowledge are better positioned to respond to environmental uncertainty and technological change. Knowledge management provides the mechanisms through which individual and collective knowledge can be transformed into organizational capabilities and strategic value. Earlier research has demonstrated that knowledge management processes influence organizational learning, decision-making, innovation, and performance, particularly when knowledge is systematically institutionalized rather than remaining dispersed among individuals (Abbasi et al., 2018). Research conducted in knowledge-based organizational contexts similarly emphasizes the growing importance of knowledge management as organizations become increasingly dependent on intellectual capital, expertise, technological competencies, and continuous learning (Sepehrian et al., 2023). Thus, knowledge management should not be understood merely as information storage or documentation but as an integrated organizational process through which knowledge is generated, circulated, combined, preserved, and converted into actionable capabilities.

The strategic relevance of knowledge management becomes particularly evident in entrepreneurship. Entrepreneurial activity depends heavily on the identification and exploitation of opportunities, interpretation of environmental signals, accumulation of market and technological experience, learning from success

and failure, and rapid recombination of existing and emerging knowledge. The relationship between knowledge management and entrepreneurship has therefore attracted considerable scholarly attention. A meta-analytic examination of this relationship has demonstrated the importance of knowledge management in strengthening entrepreneurial processes and outcomes (Rahmdel, 2021). Similarly, models of corporate entrepreneurship have explicitly incorporated knowledge management as a major foundation for developing entrepreneurial activities within organizations (Pilvar et al., 2021). Knowledge management can also strengthen entrepreneurial capabilities indirectly by supporting leadership, self-efficacy, opportunity recognition, and organizational learning; for example, entrepreneurial leadership has been identified as an important mechanism linking knowledge-management practices with entrepreneurial self-efficacy (Shayesteh et al., 2024). From a strategic perspective, alignment between knowledge-management strategy and business strategy is also necessary because knowledge becomes economically meaningful when its creation and application correspond with organizational priorities and competitive objectives (Zahedi, 2023).

These considerations are especially important for knowledge-based firms and science and technology parks. Such environments are characterized by intensive knowledge creation, technological uncertainty, entrepreneurial experimentation, multidisciplinary collaboration, and frequent interaction among universities, startups, established technology firms, investors, consultants, and public institutions. The effectiveness of knowledge and technology management systems in knowledge-based companies depends on the establishment of appropriate organizational, technological, managerial, and human infrastructures (Pourtahmasbi, 2021). Research on the factors affecting the success of knowledge management has likewise indicated that knowledge-management outcomes are shaped by interconnected

cultural, structural, technological, leadership, and human factors rather than by isolated technical interventions (Ghorbanizadeh et al., 2023). Science and technology parks therefore constitute knowledge ecosystems in which competitive advantage is generated not only through the possession of specialized knowledge but through the capacity to exchange, integrate, and renew knowledge across organizational and generational boundaries.

One increasingly important characteristic of contemporary knowledge ecosystems is generational diversity. Organizations now frequently include individuals belonging to different age cohorts who possess distinct educational experiences, technological competencies, professional identities, communication preferences, career expectations, and accumulated forms of expertise. This diversity creates both opportunities and challenges for knowledge management. Intergenerational learning refers to processes through which members of different generations exchange knowledge, skills, experiences, values, and practices and thereby learn from one another. Rather than functioning solely as a one-way process in which older employees transmit accumulated expertise to younger employees, contemporary intergenerational learning is increasingly conceptualized as reciprocal and multidirectional (Rupčić, 2018). Research among academic professionals has similarly shown that intergenerational learning can become a meaningful organizational practice when opportunities for interaction, exchange, and reciprocal learning are deliberately created (Leon, 2020). More recent research in higher education workplaces continues to emphasize the significance of intergenerational learning as workforce structures, professional roles, and knowledge requirements evolve (García-Martín et al., 2025).

The importance of intergenerational knowledge transfer derives partly from the different forms of knowledge held by older and younger organizational members. Experienced individuals often possess extensive tacit knowledge derived from years of decision-making, relationship building, crisis management, problem solving, and repeated exposure to complex professional situations. Such knowledge is difficult to formalize because it is embedded in personal experience, intuition, routines, and context. Younger individuals, in contrast, may possess stronger familiarity with emerging technologies, digital platforms, contemporary analytical tools, new market trends, and rapidly evolving technical knowledge. The challenge is therefore not simply to transfer knowledge from one generation to another but to create mechanisms through which complementary forms of

expertise can be integrated. Studies of knowledge transfer between younger and older employees highlight the importance of social and temporal comparison processes in shaping whether employees are motivated to seek, provide, or withhold knowledge (Fasbender & Gerpott, 2022). Research on multigenerational workforce management similarly suggests that effective management of generational diversity can enhance collaboration, knowledge transfer, and employee satisfaction (Chaudhary et al., 2025).

Intergenerational knowledge exchange is strongly influenced by the quality of relationships among members of different generations. High-quality intergenerational contact can create a sense of shared fate, reduce perceived distance, and strengthen mutual knowledge sharing (Dongyang et al., 2025). Trust, respect, psychological safety, willingness to communicate, and recognition of reciprocal value can therefore determine whether knowledge is openly exchanged or deliberately retained. Qualitative research on multigenerational employees has further shown that intergenerational knowledge transfer can generate meaningful consequences for both employees and organizations, reinforcing the need to understand knowledge exchange as an organizational relationship rather than a purely informational transaction (Al'Kedra, 2025). Public-sector research has likewise stressed the importance of deliberately improving knowledge-management effectiveness and facilitating knowledge transfer among generations rather than assuming that such transfer will occur automatically (Aprilyandini et al., 2025). These findings imply that intergenerational knowledge management requires social mechanisms capable of transforming generational diversity into productive collaboration.

Formal mechanisms alone, however, are insufficient. A substantial proportion of intergenerational knowledge is exchanged through informal observation, dialogue, storytelling, mentoring, joint problem solving, and day-to-day collaboration. Research on workers in the electrical utility industry has emphasized the role of informal intergenerational learning in facilitating knowledge transfer (Lotharp, 2025). Professional learning communities also provide evidence that knowledge sharing across generations can be strengthened when experienced and less experienced professionals participate in collaborative learning environments (Nkambule & Mashiane-Nkabinde, 2025). At the project level, knowledge-transfer strategies can preserve expertise that might otherwise disappear when experienced specialists leave a project or organization (Febrianty et al.,

2025). Accordingly, science and technology parks may need to create both formal and informal spaces for intergenerational interaction, including mentoring arrangements, collaborative projects, peer learning, professional communities, shared innovation activities, and network-based exchanges.

The literature on family businesses provides an additional perspective on the intergenerational dimension of entrepreneurial knowledge. Family enterprises frequently confront the challenge of transferring entrepreneurial, managerial, relational, and tacit knowledge from one generation to the next. Research based on grounded theory has demonstrated that knowledge transfer in family businesses is a complex process involving individual, relational, organizational, and contextual conditions (Ahmadi Kafshani et al., 2018). Leadership succession also represents an important channel through which knowledge is retained or lost during generational transition in family firms (Klenke, 2018). Contemporary research on succession in creative industries similarly shows that knowledge transfer is critical for maintaining continuity while allowing new generations to introduce different capabilities and strategic orientations (Wibowo & Fatimah, 2025). These insights are relevant beyond family firms because entrepreneurial ecosystems face a comparable challenge: preserving accumulated entrepreneurial experience while enabling younger entrepreneurs to reinterpret and renew that knowledge under changing technological and market conditions.

Recent studies increasingly conceptualize intergenerational knowledge sharing as a process that must be redesigned in response to fundamental changes in work. Emerging work arrangements, demographic shifts, digitalization, and changing expectations across generations require a new paradigm of workplace knowledge sharing (Kuyken & Costanza, 2025). The acceleration of technological change makes this issue particularly important because knowledge can become obsolete rapidly while new technological competencies emerge continuously. Research on technology adoption in family-owned enterprises has demonstrated that intergenerational differences may generate barriers to technological adoption at multiple organizational levels (Putri & Rajaguguk, 2025). Conversely, research in technologically intensive industries indicates that digital intelligence can facilitate intergenerational knowledge transfer when it complements rather than replaces social and experiential knowledge-exchange processes (Luo et al., 2025). Intergenerational

knowledge spillovers are also increasingly relevant in periods of technological transition, when capabilities accumulated by one generation can interact with emerging technologies and competencies developed by another (van Zundert, 2025).

Artificial intelligence and automation further complicate this relationship. Digital systems create new possibilities for codifying, storing, retrieving, and disseminating knowledge, potentially reducing the risk that organizational knowledge will disappear when experienced employees retire or leave. Artificial intelligence has specifically been proposed as a mechanism for supporting intergenerational tacit knowledge transfer, although the inherently contextual and experiential nature of tacit knowledge means that technological systems must complement human interaction rather than replace it (Falckenthal et al., 2025). Automation and AI also influence the broader process of intergenerational knowledge transmission by changing which competencies remain strategically important and how expertise is represented and transferred (Ide, 2025). This technological transformation is especially relevant to science and technology parks, where digital tools can support knowledge repositories, virtual communities, mentoring networks, collaborative platforms, and cross-generational innovation while simultaneously creating new technological gaps between generations.

The significance of intergenerational knowledge preservation is not limited to corporate settings. Research across diverse domains demonstrates that knowledge can be weakened or lost when mechanisms for transmission between generations deteriorate. Studies of traditional knowledge show that language, literacy, social participation, and educational conditions influence whether valuable knowledge is successfully transmitted across generations (Devkota & Hanemann, 2025). Studies of traditional agricultural knowledge similarly demonstrate both the vulnerability of intergenerational transmission under modernization and the opportunities for strengthening knowledge continuity (Ibrahim & Yuningsih, 2025). Research among agricultural and tribal communities has documented transformations and erosion in inherited knowledge as younger generations encounter changing socioeconomic conditions and technological practices (Seerangan & Ravi, 2025; Suman et al., 2025). In environmental contexts, intergenerational knowledge transfer has also been connected with leadership and the sustainability of knowledge needed to respond to future ecological challenges (Yadav, 2025). Although these contexts differ from entrepreneurial ecosystems, collectively

they illustrate a common principle: valuable knowledge does not automatically persist across generations and may disappear unless appropriate transfer mechanisms are established.

Similar patterns can be observed in craft and community settings. Knowledge transfer has been identified as essential for maintaining traditional craft expertise while enabling its revitalization through new design approaches and sustainability-oriented innovation (Ahmad et al., 2025). Intergenerational dialogue can likewise support the transmission of knowledge concerning traditional practices, land use, rights, and sustainable community practices when institutional and interpersonal mechanisms facilitate communication (Mustapha & Okesina, 2025). Even beyond social and organizational sciences, the concept of intergenerational transfer has been used to examine how characteristics or exposures pass between generations, demonstrating the broad analytical relevance of continuity and transmission across generational boundaries (Dai et al., 2025). For management scholarship, however, the critical issue is not merely whether knowledge is transmitted, but how organizations can intentionally govern this transfer so that valuable experiential knowledge is preserved, emerging knowledge is incorporated, and innovation is generated through their combination.

Systematic evidence indicates that organizational knowledge transfer during generational change requires identifiable procedures rather than reliance on spontaneous exchange. A systematic review of organizational knowledge-transfer procedures during generational transitions highlighted the importance of structured mechanisms for retaining and transferring knowledge when experienced members leave and new generations assume organizational responsibilities (Igoa-Iraola & Díez, 2024). In Iran, attempts have similarly been made to develop sector-specific models of intergenerational knowledge sharing. A model developed for the leasing industry underscores the importance of identifying contextual factors influencing intergenerational knowledge exchange (Rouhi Shalmaei et al., 2024), while another model focusing specifically on the automotive leasing industry demonstrates the need to conceptualize intergenerational knowledge sharing as a structured and context-sensitive management process (Rouhi Shalmaei & Khandan, 2024). These studies reinforce the proposition that general knowledge-management models may not adequately explain how knowledge moves among generations within specialized organizational ecosystems.

Nevertheless, significant barriers can constrain intergenerational knowledge transfer. Generational stereotypes, status differences, professional competition, knowledge hiding, fear of losing authority, resistance to new technologies, differences in communication patterns, and divergent attitudes toward work may reduce willingness to exchange knowledge. Younger employees may perceive experienced members as resistant to technological change, whereas older members may question the depth of younger employees' practical knowledge. Such reciprocal perceptions can undermine trust and restrict collaboration. New models of intergenerational workplace knowledge sharing therefore emphasize the necessity of moving beyond simplistic generational categories and creating working conditions that support reciprocal contribution (Kuyken & Costanza, 2025). Likewise, intergenerational knowledge-management practices need to address both structural barriers and interpersonal dynamics so that differences become sources of complementary knowledge rather than conflict (Chaudhary et al., 2025; Dongyang et al., 2025).

These challenges are particularly consequential for science and technology parks because their core mission depends on the continuous conversion of knowledge into technological and entrepreneurial value. Experienced entrepreneurs can contribute accumulated market knowledge, managerial judgment, professional networks, lessons from previous failures, negotiation skills, and long-term strategic perspectives. Younger entrepreneurs may contribute digital expertise, technological agility, contemporary innovation practices, familiarity with emerging platforms, and willingness to experiment with new business models. If these knowledge resources remain separated by generational boundaries, the ecosystem may suffer from duplicated mistakes, loss of experiential knowledge, ineffective technology adoption, and weakened organizational learning. Conversely, when experience and emerging expertise are deliberately combined, intergenerational collaboration can produce knowledge synergy, accelerate innovation, strengthen entrepreneurial capacity, and improve the sustainability of the park's collective intellectual capital.

Despite the expanding literature on knowledge management, intergenerational learning, succession, workplace knowledge transfer, and technological transformation, an important research gap remains. Much of the existing research has focused on conventional organizations, family businesses, academic institutions, public organizations, traditional communities, agricultural

settings, or specific industries. Comparatively less attention has been devoted to intergenerational entrepreneurs within science and technology parks, where knowledge transfer occurs simultaneously across individuals, firms, projects, networks, and institutional boundaries. Furthermore, studies often examine individual mechanisms such as mentoring, succession, digital technology, tacit knowledge, or organizational learning independently, whereas intergenerational entrepreneurial knowledge management is likely to involve an integrated combination of human relationships, organizational culture, leadership and governance, experiential knowledge, network structures, technological infrastructure, ecosystem learning, and barriers to knowledge exchange. This gap indicates a need for a context-sensitive model capable of explaining how these dimensions interact within science and technology parks.

Accordingly, the present study aimed to develop a comprehensive model of knowledge management for intergenerational entrepreneurs in science and technology parks.

2 Methods and Materials

The present study aimed to develop a knowledge management model for intergenerational entrepreneurs in science and technology parks. In terms of its purpose, the study was applied, and in terms of its approach, it was qualitative and exploratory. Thematic analysis was employed to analyze the data. The participant population consisted of experts and scholars in the fields of knowledge management, entrepreneurship, innovation, science and technology parks, and knowledge-based companies. Participants were selected purposively based on their academic expertise and executive experience relevant to the research topic. Data were collected through in-depth semi-structured interviews conducted both face-to-face and online, with each interview lasting between 45 and 90 minutes. The interview process continued until theoretical saturation was reached (16 participants), defined as the point at which no new and meaningful codes or concepts emerged. Following the interviews, the conversations were transcribed verbatim. After repeated reading and review of the transcripts, meaning units relevant to the research topic were extracted and coded. During the analysis process, basic

codes were classified according to their conceptual similarity and relatedness into constituent codes and organizing themes, and overarching themes were ultimately identified. To enhance the credibility of the findings, purposive selection of experts with relevant expertise and experience, diversity of participants' perspectives, complete transcription of the interviews, systematic data analysis, and continued data collection until theoretical saturation was achieved were employed. Ultimately, the qualitative data analysis led to the identification of the main dimensions and components of intergenerational entrepreneurs' knowledge management, which formed the basis for designing and presenting the conceptual model of the study.

3 Findings and Results

The participants comprised 16 experts with diverse academic, managerial, entrepreneurial, and professional backgrounds relevant to knowledge management, entrepreneurship, innovation, science and technology parks, and knowledge-based firms. Eleven participants (68.75%) held doctoral degrees and five (31.25%) held master's degrees. Their professional roles included university faculty members and professors, managers of science and technology parks and growth centers, managers of knowledge-based and technology firms, technology entrepreneurs, innovation and knowledge management consultants, researchers, and technology policy specialists. Their main areas of expertise encompassed knowledge management, technology entrepreneurship, innovation and technology, technology management, innovation management, technology startups, technology policy, entrepreneurship management, innovation ecosystems, organizational knowledge management, science and technology policy, and digital technology. Participants had between 7 and 21 years of executive experience, with an average of 14.00 years, and between 3 and 14 years of experience working in science and technology parks, with an average of 8.50 years. Their scientific and research backgrounds ranged from 2 to 27 published scientific articles. This diversity of expertise, professional responsibilities, and practical experience provided a rich and heterogeneous basis for identifying the dimensions of intergenerational entrepreneurs' knowledge management in science and technology parks.

Table 1

Overarching Themes Extracted From the Constituent Codes of Intergenerational Entrepreneurs' Knowledge Management in Science and Technology Parks

Overarching Theme	Constituent Code	Basic Code	Verbal Evidence	Participant No.
Human and Relational Foundations of Intergenerational Knowledge Management	Intergenerational trust	Mutual trust between generations	"If trust does not exist among different generations, the transfer of experience and knowledge practically does not occur."	1
		Organizational trust	"Trust is not merely individual; it must also be established at the organizational level."	2
		Professional trust	"Professional trust is more important than formal structures."	4
		Interpersonal trust	"Trust is the foundation of collaboration between generations."	6
	Bidirectional intergenerational learning	Bidirectional learning	"The younger generation is not merely a learner; sometimes the older generation must also learn new technologies."	1
		Mutual learning	"Both generations learn from each other."	9
		Reverse mentoring	"The younger generation can teach technology to the older generation."	5
	Informal knowledge interactions	Informal interactions	"Most learning takes place through everyday conversations and informal meetings."	1
		Social interaction	"Social interactions create learning."	13
	Management of intergenerational relationships	Professional interaction	"Professional interaction improves the quality of knowledge."	9
		Human relationships	"Human relationships are the foundation of knowledge transfer."	4
	Dynamics of intergenerational interactions	Continuous interaction	"Interaction must be continuous rather than occasional."	3
		Sustainable interaction	"Interactions should be long-term."	16
Knowledge-Oriented and Innovative Organizational Culture	Knowledge-sharing culture	Knowledge-sharing culture	"If knowledge sharing is not regarded as a value, individuals conceal their knowledge."	1
		Open information sharing	"Knowledge should not become monopolized."	7
	Organizational learning culture	Continuous learning	"Entrepreneurs must continuously engage in learning."	6
		Collective learning	"Learning should be collective."	14
	Innovation culture	Technological innovation	"The new generation has a greater advantage in technology."	3
		Collaborative innovation	"Innovation is the result of collaboration."	7
	Development of a participatory culture	Teamwork	"Without team building, knowledge transfer is difficult."	6
		Participatory culture	"Teamwork is the foundation of knowledge transfer."	3
Knowledge Leadership and Governance in the Entrepreneurial Ecosystem	Open innovation	Open innovation	"Open knowledge sharing contributes to innovation."	6
		Knowledge leadership	"Managers should guide the culture of knowledge transfer."	3
	Management of generational conflict	Supportive leadership	"Leaders should support knowledge transfer."	8
		Generational conflict	"Differences in the perspectives of generations sometimes lead to conflict."	5
		Conflict management	"There should be a mechanism for resolving conflicts."	5

	Acceptance of generational differences	Acceptance of generational differences	"Generations should accept each other's differences."	12
	Motivation for knowledge sharing	Role of motivation	"Without motivation, individuals do not share their knowledge."	4
	Intergenerational project-based collaboration	Joint projects	"Joint projects are the best mechanism for transferring experience."	2
		Project-based collaboration	"Joint projects facilitate knowledge transfer."	13
Management and Transfer of Entrepreneurs' Experiential Knowledge	Tacit knowledge transfer	Tacit knowledge transfer	"A large part of entrepreneurs' experience is in their minds and has not been documented."	1
		Tacit knowledge	"A large proportion of knowledge remains hidden."	9
	Documentation of entrepreneurial knowledge	Documentation of experiences	"Experiences should be documented so that they are not lost."	6
		Documentation of failures	"Failures should be documented."	11
	Experience management	Experience management	"Experiences should be documented and managed."	4
		Transfer of experience	"Experiences should be transferred to the next generation."	10
	Failure-based experiential learning	Transfer of failure-related experience	"Failures should be discussed transparently."	5
		Experience of failure	"Failures are a source of learning."	15
	Applied entrepreneurial knowledge	Applied knowledge	"Knowledge is valuable when it is applicable."	5
Structural and Network Infrastructures for Knowledge Management	Network-based organizational structure	Network structure	"Rigid administrative structures impede knowledge transfer."	1
		Participatory structure	"Participatory structures are more successful."	16
	Organizational flexibility	Organizational flexibility	"Flexible structures facilitate knowledge transfer."	5
		Acceptance of change	"Generations should accept change."	4
	Knowledge networking	Professional networking	"A significant proportion of knowledge transfer occurs through communication networks."	1
		Knowledge networks	"Networks provide a platform for knowledge transfer."	9
	Interactive learning spaces	Interactive spaces	"Parks should create spaces for dialogue."	3
		Interaction spaces	"Interaction spaces are essential for learning."	12
	Collective and collaborative knowledge	Collective knowledge	"Knowledge should become collective."	8
		Collaborative learning	"Learning becomes meaningful through collaboration."	4
Intergenerational Synergy in Innovation and Technology Development	Technological knowledge of the younger generation	Technological knowledge	"The younger generation is stronger in technology."	15
		Digital technology	"Technology should facilitate communication between generations."	2
	Managerial experience of the older generation	Managerial experience	"The older generation has experience in crisis management."	7
		Managerial knowledge	"Experienced entrepreneurs constitute valuable knowledge capital."	10
	Synergy between experience and technology	Integration of experience and innovation	"When the older generation's experience is combined with the younger generation's creativity, genuine innovation emerges."	1
		Knowledge synergy	"The knowledge of different generations should be integrated."	12
	Agility of the younger generation	Speed of the younger generation	"The new generation makes decisions more rapidly."	3

	Stability and foresight of the older generation	Long-term perspective	"The older generation has a more forward-looking perspective toward risk management."	16
Smart Ecosystem for Learning and Innovation	Learning ecosystem	Learning ecosystem	"Parks should be learning environments."	9
		Ecosystem-level learning	"The entire ecosystem should be a learning ecosystem."	16
	Innovation ecosystem	Innovation ecosystem	"Technology parks should function as learning ecosystems."	4
		Entrepreneurial ecosystem	"Knowledge develops within a shared ecosystem."	2
	Ecosystem-based knowledge modeling	Ecosystem model	"Parks should be managed through a network-based approach."	14
	Sustainability of organizational knowledge	Sustainable knowledge	"Knowledge should remain within the organization rather than only in individuals' minds."	2
	Digital knowledge management	Digital knowledge management	"Digital platforms can preserve knowledge."	6
		Communication technology	"Digital tools facilitate communication."	9
Barriers and Challenges to Intergenerational Knowledge Management	Competition and knowledge barriers	Unhealthy competition	"Intense competition causes individuals to conceal their knowledge."	2
		Knowledge hiding	"Sometimes individuals retain knowledge in order to maintain their position."	11
	Generational conflict	Differences in generational attitudes	"Generations view issues from different perspectives."	2
		Resistance of the older generation	"Some experienced managers resist new methods."	3
	Resistance to change	Fear of change	"Some individuals are afraid of change."	8

The thematic analysis resulted in the identification of eight overarching themes representing the principal dimensions of intergenerational entrepreneurs' knowledge management in science and technology parks. These themes were human and relational foundations of intergenerational knowledge management; knowledge-oriented and innovative organizational culture; knowledge leadership and governance in the entrepreneurial ecosystem; management and transfer of entrepreneurs' experiential knowledge; structural and network infrastructures for knowledge management; intergenerational synergy in innovation and technology development; smart ecosystem for learning and innovation; and barriers and challenges to intergenerational knowledge management. Collectively, these themes indicate that intergenerational knowledge management is a multidimensional process extending beyond the mere transfer of information and involving relational, cultural, managerial, structural, technological, and ecosystem-level mechanisms.

The first overarching theme, human and relational foundations of intergenerational knowledge management, emphasized the fundamental role of interpersonal relationships in facilitating knowledge exchange across generations. Intergenerational trust emerged as a central constituent code and encompassed mutual, organizational,

professional, and interpersonal trust. Participants indicated that knowledge and experience were unlikely to be exchanged effectively in the absence of trust. This theme also highlighted bidirectional intergenerational learning, demonstrating that the knowledge relationship between older and younger entrepreneurs is not unidirectional. While younger entrepreneurs may acquire managerial and experiential knowledge from more experienced individuals, they can simultaneously provide knowledge concerning emerging technologies, digital tools, and new business practices through mechanisms such as reverse mentoring. Informal knowledge interactions, professional relationships, and continuous and sustainable interaction were also identified as essential mechanisms supporting this reciprocal learning process.

The second theme, knowledge-oriented and innovative organizational culture, reflected the importance of creating an organizational environment in which knowledge sharing, continuous learning, participation, and innovation are regarded as fundamental values. Participants emphasized that when knowledge sharing is not culturally valued, individuals may tend to retain or conceal their knowledge. In contrast, open information exchange, continuous and collective learning, teamwork, and a participatory culture can strengthen knowledge circulation across generations.

Open innovation was also identified as an important component, suggesting that the free exchange and combination of knowledge can provide a foundation for collaborative innovation within science and technology parks.

The third theme, knowledge leadership and governance in the entrepreneurial ecosystem, demonstrated that effective intergenerational knowledge management requires active managerial and governance mechanisms. Knowledge-oriented and supportive leadership was considered necessary for directing and reinforcing knowledge-transfer behaviors. The findings further showed that differences in values, perspectives, working styles, and professional expectations may generate generational conflict; therefore, conflict-management mechanisms and acceptance of generational differences are necessary. Participants also emphasized motivation for knowledge sharing and intergenerational project-based collaboration. Joint projects were regarded as particularly effective because they provide opportunities for different generations to work together and transfer knowledge through practical engagement rather than through formal instruction alone.

The fourth overarching theme, management and transfer of entrepreneurs' experiential knowledge, focused on the preservation and transfer of tacit and experience-based knowledge. Participants repeatedly indicated that substantial portions of entrepreneurial knowledge remain embedded in individuals' experiences and are rarely formally documented. Accordingly, tacit knowledge transfer, documentation of entrepreneurial experiences, experience management, and the systematic transfer of knowledge to subsequent generations were identified as critical components. Particular emphasis was placed on documenting failures and learning from unsuccessful entrepreneurial experiences. The findings therefore indicate that failures should not merely be regarded as negative outcomes but can function as valuable sources of experiential learning when they are openly discussed, documented, and transferred to other entrepreneurs.

The fifth theme, structural and network infrastructures for knowledge management, concerned the organizational arrangements necessary to support knowledge flows. Participants described rigid and bureaucratic organizational structures as potential impediments to intergenerational knowledge exchange and considered flexible, participatory, and network-based structures more conducive to knowledge transfer. Professional and knowledge networks were similarly identified as important channels through which

knowledge is created and disseminated. Furthermore, interactive spaces within science and technology parks were viewed as important environments for dialogue, collaboration, and learning. The development of collective knowledge and collaborative learning was therefore closely associated with the availability of organizational and physical structures that encourage sustained interaction.

The sixth theme, intergenerational synergy in innovation and technology development, captured the complementary knowledge assets of different generations. The younger generation was characterized by stronger technological capabilities, greater familiarity with digital technologies, and greater agility and speed in decision-making. Conversely, the older generation was described as possessing deeper managerial experience, crisis-management expertise, accumulated entrepreneurial knowledge, stability, and a longer-term perspective toward risk. The participants emphasized that neither set of competencies should be considered sufficient independently. Rather, the integration of accumulated experience with technological expertise and creativity was viewed as a major source of knowledge synergy and innovation within science and technology parks.

The seventh theme, smart ecosystem for learning and innovation, extended knowledge management from the organizational level to the broader entrepreneurial ecosystem. Participants argued that science and technology parks should function as learning ecosystems in which individual entrepreneurs, firms, managers, consultants, and supporting institutions collectively participate in knowledge creation and transfer. Ecosystem-based knowledge modeling, sustainability of organizational knowledge, and digital knowledge management were important components of this theme. Digital platforms and communication technologies were particularly emphasized as mechanisms for preserving organizational knowledge, facilitating communication, and preventing valuable knowledge from disappearing when experienced individuals leave an organization.

Finally, the theme of barriers and challenges to intergenerational knowledge management revealed several factors that can obstruct effective knowledge flows. Unhealthy competition and knowledge hiding were identified as important knowledge-related barriers, particularly when individuals perceived knowledge as a source of personal power or professional security. Generational differences in attitudes and resistance among some experienced managers toward new approaches were

also reported as sources of conflict. Resistance to change and fear of change further complicated knowledge exchange between generations. These findings indicate that an effective intergenerational knowledge management model should not only establish mechanisms for knowledge creation and transfer but should also explicitly address psychological, relational, cultural, and structural barriers that may inhibit knowledge sharing.

4 Discussion

The present study aimed to develop a knowledge management model for intergenerational entrepreneurs in science and technology parks. The thematic analysis identified eight overarching themes: human and relational foundations of intergenerational knowledge management; knowledge-oriented and innovative organizational culture; knowledge leadership and governance in the entrepreneurial ecosystem; management and transfer of entrepreneurs' experiential knowledge; structural and network infrastructures for knowledge management; intergenerational synergy in innovation and technology development; a smart ecosystem for learning and innovation; and barriers and challenges to intergenerational knowledge management. Taken together, these findings indicate that intergenerational knowledge management in science and technology parks is not a linear process of transmitting information from older to younger entrepreneurs. Rather, it is a reciprocal, multidimensional, and ecosystem-based process in which relational quality, organizational culture, leadership, structural flexibility, technological infrastructure, experiential learning, and generational complementarity jointly determine whether knowledge is created, shared, retained, and transformed into entrepreneurial and innovative outcomes.

The first major finding concerned the human and relational foundations of intergenerational knowledge management, particularly intergenerational trust, reciprocal learning, informal knowledge interactions, professional relationships, and sustained interaction. Participants repeatedly emphasized that knowledge transfer is unlikely to occur effectively when different generations do not trust one another. This result suggests that the effectiveness of formal knowledge-management systems depends substantially on the relational context in which they operate. Intergenerational knowledge sharing requires individuals to perceive that sharing experience, admitting uncertainty, asking questions, and learning from another generation will

not threaten their professional position or identity. This interpretation is consistent with research showing that high-quality intergenerational contact increases mutual knowledge sharing by strengthening perceptions of common purpose and relational closeness (Dongyang et al., 2025). It also corresponds with studies emphasizing that collaboration and knowledge exchange across generations depend on supportive interpersonal conditions rather than on formal organizational arrangements alone (Al'Kedra, 2025; Chaudhary et al., 2025).

Another important aspect of this theme was the reciprocal nature of learning. Participants did not conceptualize older entrepreneurs as exclusive knowledge providers and younger entrepreneurs as passive recipients. Instead, they described a bidirectional process in which experienced entrepreneurs contribute accumulated managerial and entrepreneurial knowledge, whereas younger entrepreneurs contribute technological knowledge, digital competencies, and new approaches. This finding is closely aligned with contemporary conceptualizations of intergenerational learning that reject one-directional transmission and emphasize mutual exchange (Rupčić, 2018). Research among academics has similarly demonstrated that intergenerational learning can occur through reciprocal professional interaction and can benefit participants across different career stages (García-Martín et al., 2025; Leon, 2020). The emergence of reverse mentoring in the present study further supports the argument that knowledge value is not determined merely by age or seniority. In knowledge-intensive ecosystems, the relevant question is which generation possesses the knowledge required for a particular technological, managerial, or entrepreneurial problem.

The second overarching theme, knowledge-oriented and innovative organizational culture, showed that knowledge sharing, continuous learning, teamwork, participation, collaborative innovation, and open innovation should be institutionalized as organizational values. Participants argued that when knowledge sharing is not culturally rewarded or recognized, individuals may retain or conceal their knowledge. This result reinforces the view that knowledge management cannot be reduced to databases and formal documentation systems. Rather, its success depends on organizational norms that encourage employees and entrepreneurs to contribute knowledge voluntarily. Previous research has identified organizational culture as one of the central factors determining knowledge-management success (Ghorbanizadeh et al., 2023). Similarly, studies of knowledge-management processes have shown that

organizational learning and knowledge sharing are strengthened when institutions systematically create conditions supporting knowledge creation and dissemination (Abbasi et al., 2018). The present findings extend this perspective by demonstrating that such a culture is especially important when knowledge exchange occurs across generations with potentially different values, work habits, and communication preferences.

The emphasis on continuous and collective learning also corresponds with research on intergenerational professional learning communities. In such settings, knowledge sharing becomes more effective when organizational members participate in recurring interactions and collaboratively construct professional knowledge (Nkambule & Mashiane-Nkabinde, 2025). The findings of the present study suggest that science and technology parks should therefore operate not only as physical locations for firms but as learning environments that normalize dialogue, peer learning, experimentation, and open knowledge exchange. This is particularly important because entrepreneurial knowledge often develops through trial, interaction, and interpretation rather than through formal training alone.

The third theme, knowledge leadership and governance in the entrepreneurial ecosystem, highlighted supportive leadership, conflict management, acceptance of generational differences, motivation for knowledge sharing, and intergenerational project-based collaboration. The findings indicate that managers and ecosystem leaders play a central role in shaping the conditions under which knowledge is exchanged. Knowledge-oriented leadership can legitimize sharing behavior, create incentives for collaboration, reduce knowledge hoarding, and facilitate interaction between groups that might otherwise remain separated. This result is consistent with evidence that knowledge management is associated with entrepreneurial outcomes partly through leadership-related mechanisms (Shayesteh et al., 2024). Leadership is also important during generational transitions because it can preserve continuity while facilitating the integration of new competencies and perspectives (Klenke, 2018).

The importance attributed to generational conflict management is equally significant. Participants recognized that generations may differ in their assumptions about technology, decision-making, risk, work relationships, and appropriate managerial practices. These differences can become productive if they are acknowledged and integrated, but they can also generate resistance and communication breakdown. Research on younger and older employees

similarly suggests that knowledge transfer is shaped by social comparison and by how individuals interpret their relative expertise and status (Fasbender & Gerpott, 2022). Contemporary studies therefore call for approaches to multigenerational management that emphasize collaboration rather than stereotypical distinctions between age groups (Chaudhary et al., 2025; Kuyken & Costanza, 2025). The present study supports this position by showing that acceptance of differences and structured mechanisms for resolving conflict are integral components of intergenerational knowledge management.

The fourth theme, management and transfer of entrepreneurs' experiential knowledge, emphasized tacit knowledge, documentation of entrepreneurial experiences, experience management, learning from failure, and practical knowledge. This was one of the most consequential findings because much entrepreneurial knowledge is difficult to codify. Experienced entrepreneurs accumulate knowledge regarding markets, negotiations, organizational crises, unsuccessful decisions, stakeholder relationships, and risk assessment over long periods. If such knowledge remains exclusively in individuals' memories, organizations and ecosystems become vulnerable to knowledge loss. Existing research on organizational knowledge transfer during generational change similarly emphasizes the need for deliberate procedures to capture and transfer knowledge before experienced members leave or disengage (Igoa-Iraola & Díez, 2024). Studies of family businesses also show that intergenerational transfer involves tacit, experiential, and relational knowledge that cannot be transferred solely through formal documentation (Ahmadi Kafshani et al., 2018).

The participants' emphasis on documenting failures is especially noteworthy. Entrepreneurial ecosystems often celebrate successful ventures while unsuccessful initiatives remain underdocumented. However, failure can contain highly valuable knowledge about market conditions, strategic mistakes, financing, product development, team composition, and technology adoption. The finding therefore suggests that mature knowledge-management systems should preserve negative as well as positive experiences. This interpretation is consistent with the broader argument that organizational knowledge becomes strategically useful when it is captured, contextualized, and made available for future decision-making (Sepehrian et al., 2023; Zahedi, 2023). Within science and technology parks, repositories of lessons learned, structured reflection sessions, entrepreneurial case archives, and failure-based

learning forums may therefore constitute important mechanisms of knowledge continuity.

The fifth theme, structural and network infrastructures for knowledge management, demonstrated that flexible structures, professional networks, interactive spaces, and collaborative knowledge practices facilitate intergenerational exchange. Participants perceived rigid administrative structures as barriers to knowledge movement, whereas network-based and participatory structures were considered more supportive. This finding is consistent with research emphasizing that successful knowledge and technology management in knowledge-based organizations requires appropriate structural and organizational infrastructures (Pourtahmasbi, 2021). It also reflects the nature of science and technology parks as networked ecosystems in which knowledge frequently moves across organizational boundaries rather than through formal hierarchical channels.

Professional networks and informal interaction spaces may be especially important for transferring tacit knowledge. Previous studies have shown that informal intergenerational learning plays a substantial role in knowledge exchange because employees often learn through daily interactions, observation, conversation, and shared problem solving (Lotharp, 2025). Project-based settings similarly provide opportunities for practical knowledge transfer because individuals collaborate around concrete tasks rather than abstract knowledge-sharing objectives (Febrianty et al., 2025). Thus, the present findings suggest that park management should design both organizational structures and physical or digital interaction spaces that increase the frequency and quality of contact among entrepreneurs from different generations.

The sixth overarching theme, intergenerational synergy in innovation and technology development, reflected the complementary advantages attributed to different generations. Participants associated younger entrepreneurs with technological knowledge, digital familiarity, creativity, and decision-making agility, while older entrepreneurs were associated with accumulated managerial experience, crisis management, stability, risk awareness, and long-term perspective. The key finding was not the superiority of one generation but the value created through combining these capabilities. This interpretation aligns with the idea that intergenerational knowledge sharing should be understood as reciprocal knowledge recombination rather than replacement of older knowledge by newer knowledge (Kuyken & Costanza, 2025). It also accords with research

demonstrating that digital intelligence can strengthen intergenerational knowledge transfer when technological capabilities are integrated with accumulated professional experience (Luo et al., 2025).

The results also have implications for technological transition. Differences in technology adoption can create tensions between generations, particularly when one group interprets another as either resistant to change or insufficiently experienced. Research in family-owned enterprises has shown that intergenerational differences can become barriers to technology adoption (Putri & Rajaguguk, 2025). At the same time, technological transitions create opportunities for intergenerational knowledge spillovers, whereby accumulated expertise can be recombined with emerging technological capabilities (van Zundert, 2025). The present findings suggest that science and technology parks can exploit this potential by intentionally forming mixed-generation teams and creating projects requiring both experiential judgment and technological expertise.

The seventh theme, smart ecosystem for learning and innovation, indicated that intergenerational knowledge management should extend beyond individual firms and be institutionalized across the wider science and technology park ecosystem. Participants emphasized ecosystem learning, innovation ecosystems, organizational knowledge sustainability, and digital knowledge management. This finding is particularly relevant because science and technology parks consist of multiple interacting actors, and valuable knowledge may be distributed among entrepreneurs, firms, mentors, universities, investors, and support institutions. The implication is that knowledge management should operate at multiple levels simultaneously. Research on knowledge strategy similarly highlights the importance of aligning knowledge-management systems with broader organizational and business strategies (Zahedi, 2023). Moreover, sector-specific models of intergenerational knowledge sharing have shown that context-sensitive, structured approaches are needed to institutionalize knowledge exchange across organizational settings (Rouhi Shalmaei & Khandan, 2024; Rouhi Shalmaei et al., 2024).

Digital technologies were also central to this ecosystem theme. Participants viewed digital platforms as mechanisms for preserving knowledge and facilitating communication across generations. This finding is supported by recent work showing that artificial intelligence and digital technologies can assist in the preservation and transfer of tacit knowledge, although they cannot fully substitute for human interaction

(Falckenthal et al., 2025). Automation and AI are also changing how knowledge is generated, stored, and transmitted across generations (Ide, 2025). Accordingly, digital knowledge-management platforms in science and technology parks may be most effective when they complement mentoring, dialogue, collaborative problem solving, and community-based learning.

Finally, the eighth theme, barriers and challenges to intergenerational knowledge management, included unhealthy competition, knowledge hiding, generational disagreement, resistance among some experienced individuals, and fear of change. These findings demonstrate that knowledge does not flow automatically simply because individuals possess complementary expertise. Knowledge may be intentionally withheld when it is perceived as a source of status, competitive advantage, or occupational security. Similar concerns have been identified in studies of generational knowledge transfer, which emphasize that motivational, relational, and comparative processes can either facilitate or inhibit knowledge exchange (Al'Kedra, 2025; Fاسبندر & Gerpott, 2022). The findings therefore imply that effective knowledge management must address both enabling conditions and inhibiting mechanisms. Incentives, trust-building, fair recognition systems, collaborative projects, and inclusive governance may be necessary to reduce knowledge hiding and resistance.

5 Conclusion

Overall, the proposed model demonstrates that intergenerational knowledge management in science and technology parks is best understood as a dynamic ecosystem in which human relationships, cultural values, leadership, experiential knowledge, organizational structures, technology, and generational diversity interact. This interpretation is compatible with broader evidence showing that intergenerational knowledge transfer can preserve organizational memory, enhance learning, support succession, and strengthen adaptive capacity across diverse contexts (Igoa-Iraola & Díez, 2024; Rupčić, 2018; Wibowo & Fatimah, 2025). The distinctive contribution of the present study lies in integrating these dimensions within the context of entrepreneurial actors operating in science and technology parks. The findings suggest that knowledge continuity and innovation should not be treated as competing objectives. Rather, innovation can be enhanced precisely through the integration of accumulated entrepreneurial experience with emerging technological and entrepreneurial competencies.

This study has several limitations that should be considered when interpreting its findings. First, the research adopted a qualitative exploratory design and involved 16 purposively selected experts; therefore, the findings are analytically rather than statistically generalizable. Second, participants were selected on the basis of expertise and experience in knowledge management, entrepreneurship, innovation, and science and technology parks, which may have resulted in greater representation of managerial and expert perspectives than those of early-career entrepreneurs or operational employees. Third, the data were based on participants' self-reported perceptions and professional experiences and may therefore have been influenced by recall, interpretation, or social desirability. Fourth, although theoretical saturation was achieved, the study did not quantitatively test the relationships among the identified dimensions. Finally, intergenerational dynamics may vary according to organizational size, technological sector, ownership structure, regional innovation capacity, and institutional characteristics, which were not separately examined in the present study.

Future studies should quantitatively validate the proposed model using confirmatory factor analysis and structural equation modeling with larger samples of entrepreneurs, managers, employees, and knowledge workers in science and technology parks. Comparative studies across different parks, regions, industries, and countries could determine which dimensions are context-specific and which are broadly applicable. Longitudinal research would also be valuable for examining how intergenerational knowledge relationships evolve over time and during succession, organizational growth, technological disruption, or leadership change. Future researchers could additionally investigate mediating and moderating mechanisms such as organizational trust, psychological safety, technological readiness, leadership style, knowledge-sharing motivation, generational identity, and organizational culture. Mixed-method studies could provide deeper understanding by integrating quantitative testing with observation, interviews, and network analysis. Experimental or intervention-based research could further assess whether mentoring, reverse mentoring, digital knowledge platforms, cross-generational project teams, or structured experience-documentation programs produce measurable improvements in knowledge transfer and innovation.

Managers of science and technology parks should establish explicit mechanisms for continuous intergenerational knowledge exchange rather than relying on

spontaneous interaction. Mixed-generation project teams, mentoring and reverse-mentoring programs, communities of practice, experience-sharing sessions, and structured dialogue forums can create repeated opportunities for reciprocal learning. Park administrators should also develop systems for documenting entrepreneurial experiences, failed projects, lessons learned, crisis-management practices, and successful innovation processes so that knowledge remains available beyond individual careers. Digital knowledge repositories and collaborative platforms should be integrated with face-to-face interaction to preserve knowledge without weakening relational learning. Leadership development programs should train managers to recognize generational differences, resolve conflict, reduce stereotypes, and reward knowledge-sharing behaviors. Finally, evaluation systems should recognize collaborative knowledge contribution, while organizational structures and physical spaces should be designed to encourage networking, informal interaction, experimentation, and sustained cooperation among entrepreneurs from different generations.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

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