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Ali. Hosseini¹, Hossein. Kazemi^{2*},
Malikeh. Beheshtifar³

- 1 PhD student, Department of Public Administration, Raf.C., Islamic Azad University, Rafsanjan, Iran
- 2 Assistant Professor, Department of Public Administration, Vali-e-Asr University, Rafsanjan, Iran
- 3 Associate Professor, Department of Public Administration, Raf.C., Islamic Azad University, Rafsanjan, Iran

Corresponding author email address:
h.kazemi@vru.ac.ir

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Designing a Knowledge-Intensive Entrepreneurship (KIE) Model: A Case Study of the Academic Center for Education, Culture and Research (ACECR)

ABSTRACT

Knowledge-intensive entrepreneurship is an ecosystemic approach aimed at creating, developing, distributing, and applying knowledge resources among various environmental actors. This approach emphasizes open knowledge structures and seeks to establish a generative source of learning, innovation, and socioeconomic dynamism. Accordingly, the implementation of such an approach in research-oriented organizations requires a model capable of explaining the institutional, cognitive, environmental, and knowledge-dissemination ecosystem mechanisms. The aim of this study was to design a knowledge-intensive entrepreneurship (KIE) model for the Academic Center for Education, Culture and Research (ACECR). Data were collected through interviews with 12 academic and organizational experts. The methodological approach of the study was qualitative, and thematic analysis was employed. The findings comprised 129 basic themes, 41 organizing themes, and 6 overarching themes, including ontological manifestation, governance reference-building in knowledge-intensive entrepreneurship, contingent cognitive mapping of knowledge-intensive entrepreneurship capacities, phenomenological environmentalism of the knowledge-intensive entrepreneurship chain, the strategic ecosystem of the knowledge-intensive entrepreneurship chain, and the realization of the higher-order goals of knowledge-intensive entrepreneurship. Based on the findings, it can be stated that the originality of the proposed model lies in redefining knowledge-intensive entrepreneurship as an institutional logic for enabling the flow of knowledge generated within ACECR. This logic regards knowledge as the foundation for shaping governance actions, capacity building, environmental interaction, and developmental value creation. Accordingly, the research model indicates that ACECR can, beyond its research-oriented mission, become a reference-setting, connective, and transformative institution within the knowledge-intensive entrepreneurship ecosystem and, through knowledge spillovers, contribute to solving national problems, strengthening knowledge-based self-reliance, and sustaining socioeconomic value creation.

Keywords: knowledge-based economy, knowledge-intensive entrepreneurship, knowledge spillover theory.

Introduction

The transition toward a knowledge-based economy has fundamentally transformed the logic of value creation, organizational development, and entrepreneurial action. In traditional industrial economies, value was primarily derived from physical assets, standardized production, and the efficient allocation of tangible resources; however, in contemporary knowledge economies, the central sources of competitiveness increasingly lie in the generation, circulation, absorption, recombination, and commercialization of knowledge. Knowledge is no longer regarded merely as a scientific output or an internal organizational resource, but as a strategic input for innovation, entrepreneurship, institutional transformation, and

socioeconomic development. This shift has intensified scholarly attention to knowledge-intensive entrepreneurship (KIE), which refers to entrepreneurial processes in which knowledge plays a central role in identifying opportunities, designing solutions, creating innovation, and producing economic and social value. The expansion of the knowledge economy has also changed the spatial, institutional, and sectoral dynamics of entrepreneurship, as knowledge-based activities increasingly depend on networks of universities, research institutes, firms, public agencies, markets, digital infrastructures, and intermediary organizations [1-4]. Accordingly, KIE should not be understood as a narrow firm-level phenomenon, but rather as a systemic and ecosystemic process through which knowledge resources are mobilized, transformed, and diffused across organizational, regional, and national boundaries.

The theoretical foundation of knowledge-intensive entrepreneurship is closely associated with the knowledge spillover theory of entrepreneurship, which argues that knowledge generated in universities, research organizations, public investment systems, industrial clusters, and innovative firms does not automatically become economic or social value unless entrepreneurial actors identify, absorb, recombine, and exploit it. In this view, entrepreneurship functions as a mechanism for converting underutilized knowledge into innovation, new ventures, technologies, services, and developmental outcomes. Recent advances in this literature have emphasized that knowledge spillovers differ across contexts, regions, institutional arrangements, and entrepreneurial capacities, and that the mere production of knowledge is insufficient without effective channels for diffusion, commercialization, and value creation [5-8]. Moreover, the knowledge spillover perspective has increasingly moved beyond conventional innovation settings toward broader ecosystemic, circular, and value-oriented interpretations of entrepreneurship, highlighting the importance of institutional values, sustainability, public investment, and entrepreneurial agency in shaping the outcomes of knowledge diffusion [9-12]. Therefore, KIE requires not only knowledge production but also mechanisms for knowledge recognition, transfer, absorption, recombination, and application.

Within this framework, universities and research-oriented institutions occupy a particularly important position because they are among the main generators of scientific, technological, and professional knowledge. Yet the contemporary role of such institutions extends beyond education and research toward entrepreneurship, innovation, social problem solving, technology transfer, and ecosystem orchestration. The concept of the entrepreneurial university reflects this transformation, emphasizing that higher education institutions should act as active agents in regional and national innovation systems by mobilizing knowledge, developing entrepreneurial capacities, supporting technology transfer, and engaging with external stakeholders. Studies on entrepreneurial university transformation show that universities require new governance models, incentive structures, technology transfer offices, stakeholder networks, and entrepreneurial cultures in order to move from knowledge production to knowledge-based value creation [13-16]. In addition, the university entrepreneurial ecosystem is increasingly viewed as a complex configuration of actors, resources, policies, norms, infrastructures, and cultural drivers that shape entrepreneurial intention, entrepreneurial culture, and innovation outcomes [17-19]. This indicates that research-oriented organizations need integrated models capable of linking knowledge creation to entrepreneurship, governance, stakeholder engagement, and sustainable development.

The emergence of KIE also depends on the ability of organizations and ecosystems to absorb and utilize external knowledge. Entrepreneurial absorptive capacity is therefore a critical enabler of knowledge-intensive entrepreneurship, because organizations must identify valuable knowledge, interpret it in relation to opportunities, combine it with existing capabilities, and apply it in innovative products, services, processes, and business models [20-22]. This capability is particularly

important in knowledge-intensive environments where technological change, market uncertainty, and social complexity require continuous learning and recombination of dispersed knowledge. Knowledge sharing and employee competencies also play a decisive role in enabling KIE, especially in higher education institutions and research-based organizations, because individual and collective competencies determine whether generated knowledge remains confined within organizational boundaries or becomes a foundation for entrepreneurial action [23]. Similarly, studies of knowledge-intensive entrepreneurial firms show that innovation is shaped by relational proximity, homophilic ties, interfirm learning, and connectedness among entrepreneurs and ecosystem actors [24-26]. These insights suggest that any model of KIE must account for the cognitive, relational, and capability-based foundations of knowledge mobilization.

Another important dimension of KIE concerns the institutional and infrastructural conditions through which knowledge is transformed into marketable, scalable, and socially valuable outcomes. Technology transfer, foreign direct investment, supply chain finance, digital platforms, coworking spaces, and knowledge-intensive business services all represent mechanisms through which knowledge may circulate across organizational and sectoral boundaries. The literature on technology transfer and knowledge spillovers highlights that the presence of knowledge does not guarantee innovation unless intermediary institutions, transfer mechanisms, and market linkages are sufficiently developed [27-29]. Similarly, digital-intensive business models and digital resilience have become increasingly important for entrepreneurship in the knowledge economy, because digital infrastructures enable knowledge integration, rapid experimentation, market access, and adaptive responses to uncertainty [30, 31]. Sectoral evidence also shows that knowledge spillovers may contribute to green breakthrough innovation in supply chains, innovation-based transformation in small and medium-sized enterprises, and startup development in knowledge-based economies [32-34]. Therefore, institutional, technological, and market infrastructures are essential for transforming KIE from an abstract concept into an operational organizational model.

Recent research also indicates that knowledge-intensive entrepreneurship should be interpreted through the lens of sustainable value creation rather than merely through economic commercialization. The connection between entrepreneurial perspectives and sustainable value creation shows that KIE can contribute simultaneously to economic performance, social welfare, environmental sustainability, and institutional development [35]. This broader interpretation is consistent with studies on circular economy entrepreneurship, green innovation, sustainable agricultural entrepreneurship literacy, and frugal innovation in developing regions, all of which demonstrate that knowledge-intensive entrepreneurial processes can address complex societal problems when they are embedded in sustainability-oriented ecosystems [36-38]. Moreover, post-pandemic and sector-specific experiences, such as knowledge-based entrepreneurship programs in tourism and social innovation within university ecosystems, indicate that KIE can support learning, resilience, inclusion, and social transformation when supported by appropriate institutional and ecosystemic mechanisms [39, 40]. Thus, KIE should be considered not only a pathway to commercial outputs but also a governance logic for solving socioeconomic problems through knowledge-based value creation.

The ecosystemic nature of KIE is especially visible in studies that examine entrepreneurship across regional, national, and cross-border contexts. Innovation ecosystems in Africa, social entrepreneurship spillovers, regional entrepreneurship subsidy policies, and youth employment dynamics all show that knowledge-based entrepreneurship is shaped by spatial proximity, institutional support, public policies, labor-market structures, and regional development pathways [41-44]. These findings are important because they show that knowledge-intensive entrepreneurship is not reducible to internal organizational

capacities; rather, it emerges through interactions among macro-level policy frameworks, meso-level ecosystem structures, and micro-level entrepreneurial agency. Regional and local studies further demonstrate that entrepreneurial ecosystems require evaluation frameworks, employment capability approaches, science and technology park assessment models, and open-data governmental infrastructures to support knowledge-based entrepreneurship effectively [45-47]. In this respect, the design of a KIE model must incorporate not only knowledge production and commercialization, but also governance, ecosystem coordination, access to resources, stakeholder positioning, and contextual adaptation.

Despite the growth of research on knowledge spillovers, entrepreneurial universities, knowledge-intensive firms, and innovation ecosystems, an important gap remains in explaining how research-oriented organizations can institutionally organize their knowledge resources in order to generate entrepreneurial outcomes. Much of the existing literature has examined specific components of this phenomenon, such as absorptive capacity, technology transfer, entrepreneurial culture, knowledge sharing, digital business models, or regional spillovers; however, fewer studies have provided an integrated model that explains how a research-based organization can simultaneously activate its ontological identity, governance mechanisms, cognitive capacities, environmental interactions, strategic ecosystem, and higher-order developmental goals. This gap is especially important in organizations whose primary mission has historically been research, education, cultural development, or technological advancement, because such organizations often generate substantial knowledge resources but may lack a coherent mechanism for transforming these resources into entrepreneurial value. The intellectual framework of knowledge-intensive innovative entrepreneurship confirms the need for more comprehensive conceptual models that integrate knowledge, innovation, opportunity recognition, ecosystem relations, and institutional strategy [48]. In addition, evidence on academic entrepreneurs suggests that behavioral and knowledge spillovers from research-based entrepreneurship can influence broader ecosystems when properly supported by structured programs and institutional arrangements [49]. Therefore, a context-sensitive model is needed to explain how knowledge-intensive entrepreneurship can be designed and operationalized in research-oriented organizations.

The Academic Center for Education, Culture and Research represents a suitable context for examining this issue because it is a research-oriented organization with capacities in knowledge production, applied research, technology development, education, commercialization, and engagement with national problems. For such an organization, KIE is not merely a matter of creating new ventures or commercializing isolated research outputs; rather, it requires a systemic model that can redefine knowledge as a strategic asset, connect research capacities with stakeholder needs, establish governance mechanisms for knowledge-based entrepreneurship, and create pathways for knowledge spillovers into economic and social domains. The development of such a model can help clarify how research-oriented organizations may move from fragmented project-based activities toward integrated entrepreneurial ecosystems in which knowledge is identified, structured, mobilized, transferred, commercialized, and converted into sustainable value. Therefore, the aim of the present study is to design a knowledge-intensive entrepreneurship model for the Academic Center for Education, Culture and Research.

Methodology

In terms of purpose, this study is applied; and in terms of its philosophical foundation and the use of a qualitative technique, it is situated within an interpretivist paradigm. Among the various qualitative methodological approaches, thematic analysis was selected. Semi-structured interviews were used as the data collection instrument. In the qualitative

sampling stage, the expert population was selected purposively from two groups: academic experts and organizational experts. For academic experts, criteria such as distinguished scientific records—including book authorship, implementation of applied projects, publication of reputable articles—and experience in supervising postgraduate research in related fields, including entrepreneurship, entrepreneurial ecosystems, entrepreneurship development, entrepreneurial behaviors, creativity and innovation, knowledge-based firms, the knowledge-based economy, and science and technology parks, were considered. In addition, in selecting organizational experts, the focus was placed on individuals holding strategic responsibilities; the criteria included having at least 5 years of executive and managerial experience at middle and senior levels in ACECR, direct experience in implementing research–technological plans and projects, active participation in commercialization and technology development processes, practical familiarity with the mechanisms of knowledge-based firms and the innovation ecosystem, and holding at least a master’s degree or higher. Accordingly, the opportunity was provided to benefit from the operational knowledge of managers who are directly familiar with the existing structures and gaps in this pathway, so that, through the guidance of these members, practical solutions could be formulated to improve the model and they could play an effective role in advancing the objectives of the present study. The interviews continued until theoretical saturation was reached. In this approach, whenever the researcher concludes that the responses obtained from the interviews are largely similar and that no new responses or information will be generated, the number of interviews conducted is considered sufficient and the interview process is terminated. On average, each interview lasted 45 minutes, depending on the richness of its content. Since theoretical saturation was achieved after 12 interviews, the interview process was ended, and the researcher considered the number of conducted interviews sufficient. The researcher then proceeded to coding and categorization based on the thematic analysis technique at the levels of initial textual concepts, basic themes, organizing themes, and global themes. Table 1 presents the characteristics of the experts.

Table 1*Characteristics of the Interviewees*

No.	Gender	Age	Education	Specialization	Job Position
1	Male	44	PhD	Public Administration	Faculty Member
2	Male	51	PhD	Public Administration	Faculty Member
3	Male	55	PhD	Civil Engineering	Deputy for Research and Technology
4	Female	39	PhD	Entrepreneurship Management	Faculty Member
5	Female	56	PhD	Medicine	Deputy for Education
6	Male	61	PhD	Medicine	Head of Unit
7	Male	44	PhD	Business Management	Head of Research Institute
8	Female	47	PhD	Public Administration	Faculty Member
9	Male	36	PhD	Entrepreneurship Management	Faculty Member
10	Male	41	PhD	Entrepreneurship Management	Faculty Member
11	Male	58	PhD	Medicine	Deputy for Research and Technology
12	Male	49	PhD	Information Technology Engineering	Deputy for Support Affairs

To assess the validity of the study, content validity was examined using two criteria: the CVR, or Lawshe’s content validity ratio (Lawshe, 1975), and the CVI, or content validity index. The total CVR coefficient was estimated at 0.776, and the total CVI coefficient was estimated at 3.411. Since the CVR coefficient was higher than 0.75 with the participation of 8 experts in the study, it can be stated that the research findings were confirmed by the experts in terms of the CVR coefficient. Moreover, the CVI was higher than the average level (= 3), confirming the consensus of expert evaluations. To calculate the reliability of the interviews through the test–retest method, four interviews were selected from among the conducted interviews, and each was recoded by the researcher after a 25-day interval. The test–retest reliability was calculated as 94.37%, indicating

the reliability of the interview coding process performed by the researcher. Intercode reliability was also assessed, whereby the researcher and another qualitative researcher independently coded the data. For this purpose, a PhD student in management who was familiar with the coding process was asked to participate in the coding of the study, and the final intercode reliability was determined to be acceptable at 87.19%.

Findings and Results

In the initial analysis of the interview texts, 683 concepts or initial codes were extracted. These initial concepts formed the basis of the thematization process. Through an in-depth examination of the initial concepts, 566 concepts that shared semantic commonalities were identified and categorized into 129 basic themes. At the intermediate level of thematic analysis, which is devoted to organizing themes and concerns the implicit implications of the main assumptions derived from the basic themes, thereby providing the necessary basis for the researcher to construct the thematic network, 41 organizing themes were categorized through the examination of the basic themes. Finally, at the final level of thematic analysis, 6 global themes, representing the main and cross-sectional metaphors of the study, were obtained. Table 2 presents the basic, organizing, and global themes.

Table 2

General Structure of the Data

Global Themes	Organizing Themes	Basic Themes
Ontological manifestation of KIE	Essential elements of KIE	Integration of value-creating systems; research-oriented origin; knowledge-oriented individuation; representation of differentiating transformations; creative thinking; multidimensional complexity
Ontological manifestation of KIE	Transformationalism of the economic functions of KIE	Changing traditional orientations; energizing innovation and economic competitiveness; innovative intersectoral opportunism; problem-oriented economic identity formation
Ontological manifestation of KIE	Domain-oriented penetration of KIE	Systemic impact; increasing multi-contextual knowledge orientation
Ontological manifestation of KIE	Acceptance of the strategic postulates of KIE	Problem-oriented mission; strategic horizon orientation; risk-taking orientation
Governance reference-building in knowledge-intensive entrepreneurship	New investment system of KIE	Capital concentration on emerging fields; reconfiguration of knowledge-based investments; commercialization of knowledge capacities
Governance reference-building in knowledge-intensive entrepreneurship	Development of inter-domain communications in the KIE ecosystem	Inter-domain knowledge connectivity; inter-domain networking of research teams; organizational structural agility; active interaction in the knowledge ecosystem
Governance reference-building in knowledge-intensive entrepreneurship	Non-confinement of organizational knowledge	Avoidance of document-based restriction of knowledge; elimination of closed-loop intraorganizational thinking
Governance reference-building in knowledge-intensive entrepreneurship	Functional mapping of KIE achievements	Multifaceted representation of generated knowledge; framework for representing knowledge achievements; categorization of research achievements
Governance reference-building in knowledge-intensive entrepreneurship	Modeling the logic of KIE	Centrality of knowledge-oriented logic; modeling the dependence of the KIE chain on the knowledge management system; identification of knowledge production origins; expansion of knowledge creation platforms
Governance reference-building in knowledge-intensive entrepreneurship	Strategic adaptability of KIE	Strategic alignment of KIE; designing the KIE chain around national problems; knowledge-oriented solution-creation approach
Governance reference-building in knowledge-intensive entrepreneurship	Management of KIE value assets	Management of knowledge capital; entrepreneurial valorization of knowledge; management of organizational intellectual capital
Governance reference-building in knowledge-intensive entrepreneurship	Formulation of an ethics-oriented system for knowledge-based projects	Defining an ethical framework; ethical regulation of knowledge ownership; prevention of instrumental misuse of knowledge; principle of confidentiality of findings from commissioned projects; principle of public disclosure of general findings from knowledge projects
Governance reference-building in knowledge-intensive entrepreneurship	Decentralized developmental policymaking	Determining the developmental requirements of KIE; decentralization of decision-making
Contingent cognitive mapping of KIE capacities	Development of employees' problem-oriented intelligence	Problem-oriented creativity; problem-oriented perceptions
Contingent cognitive mapping of KIE capacities	Development of employees' cognitive-analytical capabilities	Ability to perform complex analyses; entrepreneurial soft competencies; strengthening knowledge-oriented synthesis skills

Contingent cognitive mapping of KIE capacities	Constructive environmental interactability	Resilient perceptibility; professional and constructive external agency
Contingent cognitive mapping of KIE capacities	Foundational assumption-orientation of KIE	Identification of organizational logic; institutional redefinition of KIE; mission orientation of KIE; incorporation of KIE into research–operational programs; knowledge justice orientation
Contingent cognitive mapping of KIE capacities	Learning and failure-tolerant entrepreneurial culture	Establishment of a knowledge-intensive entrepreneurial culture; avoidance of failure aversion within the ecosystem; development of a learning and failure-tolerant KIE ecosystem
Contingent cognitive mapping of KIE capacities	Strategic frameworking of knowledge pathways	Knowledge routing; designing a theory-to-practice mechanism; evaluating the strategic success of knowledge strategies
Contingent cognitive mapping of KIE capacities	Instrumentology of the KIE chain	Determination of diverse instruments in the KIE chain; knowledge transfer through instruments of the KIE chain
Contingent cognitive mapping of KIE capacities	Technological mathematization of the KIE chain	Equation-based modeling of the KIE chain; storage of information on the steps of the KIE chain; development of an integrated technological infrastructure
Contingent cognitive mapping of KIE capacities	Training and development of knowledge-enhancement contexts	Development of technology-oriented human capital; informal knowledge-enhancing participation; specialized organization of entrepreneurial teams
Phenomenological environmentalism of the KIE chain	Knowledge alertness of the KIE environment	Development of scientific–knowledge platforms; systematic monitoring of knowledge gaps
Phenomenological environmentalism of the KIE chain	Monitoring stakeholder agency in the KIE chain	Continuous interactions with stakeholders; patterns of role enactment by actors in the KIE chain
Phenomenological environmentalism of the KIE chain	Identification of environmental shocks	Identification of destructive and disruptive factors in the KIE chain; impact of economic fluctuations; occurrence of investment risk aversion
Phenomenological environmentalism of the KIE chain	Perceived real support mechanisms in the KIE chain	Level of targeted and long-term investments; realistic evaluation of KIE projects
Phenomenological environmentalism of the KIE chain	Perceived injustice in access to KIE facilities	Uneven distribution of KIE-related facilities; unequal access of provincial units to fundamental facilities; level of professional human-resource provision
Strategic ecosystem of the KIE chain	Intelligent market orientation of KIE	Investment in knowledge-generating opportunities; intelligent market behavior analysis; diverse market interaction; broad-scope market recognition
Strategic ecosystem of the KIE chain	Drawing the task-positioning network of KIE-chain stakeholders	Identification of KIE-chain stakeholders; task positioning of KIE-chain stakeholders
Strategic ecosystem of the KIE chain	Monitoring and scenario-building for KIE-chain events	Designing a risk-monitoring system for the KIE chain; management of process disruptions in the KIE chain; scenario-oriented foresight for the KIE chain
Strategic ecosystem of the KIE chain	Integration of knowledge-circulation networks	Activation of the intraorganizational knowledge-circulation network; activation of the extraorganizational knowledge-circulation network
Strategic ecosystem of the KIE chain	Identification of KIE-chain catalysts	Recognition of catalysts in the field of knowledge and technology; recognition of institutional catalysts of KIE
Strategic ecosystem of the KIE chain	Formulation of a strategic roadmap for product–knowledge domains	Identification of product–knowledge overlaps; reformulation of the product–knowledge map; innovative network-based opportunity recognition; redesign of innovative network relations
Strategic ecosystem of the KIE chain	Digitalization of KIE infrastructures	Development of a knowledge-oriented platform at the national level; establishment of a comprehensive knowledge repository
Strategic ecosystem of the KIE chain	Recreation of the KIE spillover system	Active agency in knowledge distribution; development of an interconnected geography of knowledge; knowledge-based participation; revitalization of knowledge outputs
Strategic ecosystem of the KIE chain	Functional sourcing of knowledge–experience	Systematic sourcing of knowledge–experience; multipurposing of knowledge–experience
Realizability of the higher-order goals of KIE	Stabilization of the knowledge-based economy	Effective field presence; active agency in the knowledge-based economic system; improvement of knowledge-oriented revenue-generating capacities; market-oriented routing of research achievements; value creation in the knowledge-based economy; resilient stabilization of the economic system
Realizability of the higher-order goals of KIE	Strengthening competitive responsiveness capability	Reproduction of organizational capabilities; ability to discover practical problem-oriented solutions; knowledge-oriented competitiveness; demand-driven responsiveness
Realizability of the higher-order goals of KIE	Productivization of value assets in the KIE chain	Strategic assetization of knowledge; integration of knowledge into the value chain; productivization of knowledge flows
Realizability of the higher-order goals of KIE	Strengthening self-reliance in KIE governance	Development of indigenous knowledge foundations; knowledge-based self-reliance; facilitation of the knowledge-based governance system
Realizability of the higher-order goals of KIE	Dynamization of project identification in emerging KIE contexts	Active knowledge-based project identification; new research orientations in KIE

1. Ontological manifestation of KIE: Ontological manifestation in knowledge-intensive entrepreneurship (KIE), beyond a change in the business model, refers to a fundamental change in the identity and existential nature of research-oriented organizations. At this level, knowledge is transformed from a mere input for writing scientific articles into a dynamic entity that is multiplied and reproduced through entrepreneurial processes. This paradigm is based on the knowledge spillover theory of entrepreneurship, according to which knowledge, as a public good, remains

incomplete unless it is converted into economic and social value through entrepreneurial agency and knowledge dissemination among knowledge beneficiaries. In fact, the ontological manifestation of KIE means that the organization no longer defines itself merely as a seeker of knowledge, but rather as an agent for solving complex social problems through creative integrations of knowledge. This perspective transforms the organization from a closed scientific institution into a scientific institution with an open knowledge ecosystem, whose identity is evaluated based on the intensity of knowledge applied in products and services within the socioeconomic system.

2. **Governance reference-building in knowledge-intensive entrepreneurship:** Governance reference-building in knowledge-intensive entrepreneurship means the establishment of a dynamic, networked, and organic platform that guides the process from idea creation to knowledge dissemination and commercialization with an ecosystem-oriented emphasis. Governance reference-building in KIE highlights the institutional and policy dimension of knowledge-intensive entrepreneurship. This category indicates that knowledge-intensive entrepreneurship is not realized merely through possessing knowledge, specialized human resources, or technological capacity; rather, it requires a decision-making system, transparent rules, accountability mechanisms, policymaking, networking, resource allocation, stakeholder management, and results evaluation. Governance reference-building regards and defines knowledge-intensive entrepreneurship as a field of governance. This is a field in which knowledge must be transformed into opportunity, innovation, value, and development through credible institutional mechanisms. In this paradigm, organizations, through decentralized developmental policymaking, seek to activate knowledge cores and peripheral actors and increase knowledge-based assets in order to enhance their operational empowerment, thereby enabling them to regain autonomy of action and make immediate decisions when confronting complex environmental issues, without waiting for prescriptive and top-down directives. This type of reference-building, through modeling the logic of knowledge-intensive entrepreneurship, shifts the mental frameworks and norms of the ecosystem from closed and local competition toward network synergy and shared value creation. On the other hand, to prevent business-oriented reductionism and deviation from the missions of the knowledge-intensive entrepreneurship paradigm, the formulation of an ethics-oriented system for knowledge-based projects at this level ensures that the orientation of innovations is not directed solely toward economic profitability, but is integrated with social responsibility and the resolution of environmental and human challenges.
3. **Contingent cognitive mapping of KIE capacities:** Contingent cognitive mapping of KIE capacities refers to the creation and expansion of a dynamic and networked mental model that aligns the organization's internal capacities with the unlimited complexities of the external environment. This category refers to the process through which the organization identifies, understands, classifies, and interprets its knowledge-based, human, technological, institutional, network, and infrastructural capacities in relation to entrepreneurial opportunities. Cognitive mapping means creating a clear, analytical, and applicable image of organizational capacities. This mapping is not limited to collecting information about limited resources; rather, it creates an organizational understanding of the following questions: What type of knowledge does the organization possess? In which domains can this knowledge be converted into value? Which capabilities are evident, and which capacities are hidden or latent? What connection exists among human capital, technological infrastructure, prior experiences, external networks, and future opportunities? And which capacities, under what conditions, can lead to knowledge-intensive entrepreneurship? In

this category, the foundational assumption-orientation of KIE constitutes the philosophical basis and guide for organizational actions and institutionalizes the deep belief that closed knowledge cannot represent its true intrinsic value unless it is linked to the real needs of society. The realization of such a profound insight requires the development of employees' cognitive–analytical capabilities so that they, too, can achieve a systemic understanding of the innovation ecosystem. In this progressive approach, employees continuously develop their cognitive maps through training and the development of knowledge-enhancement contexts in order to absorb external knowledge and apply it intelligently for operational updating, while avoiding knowledge-concealing behaviors.

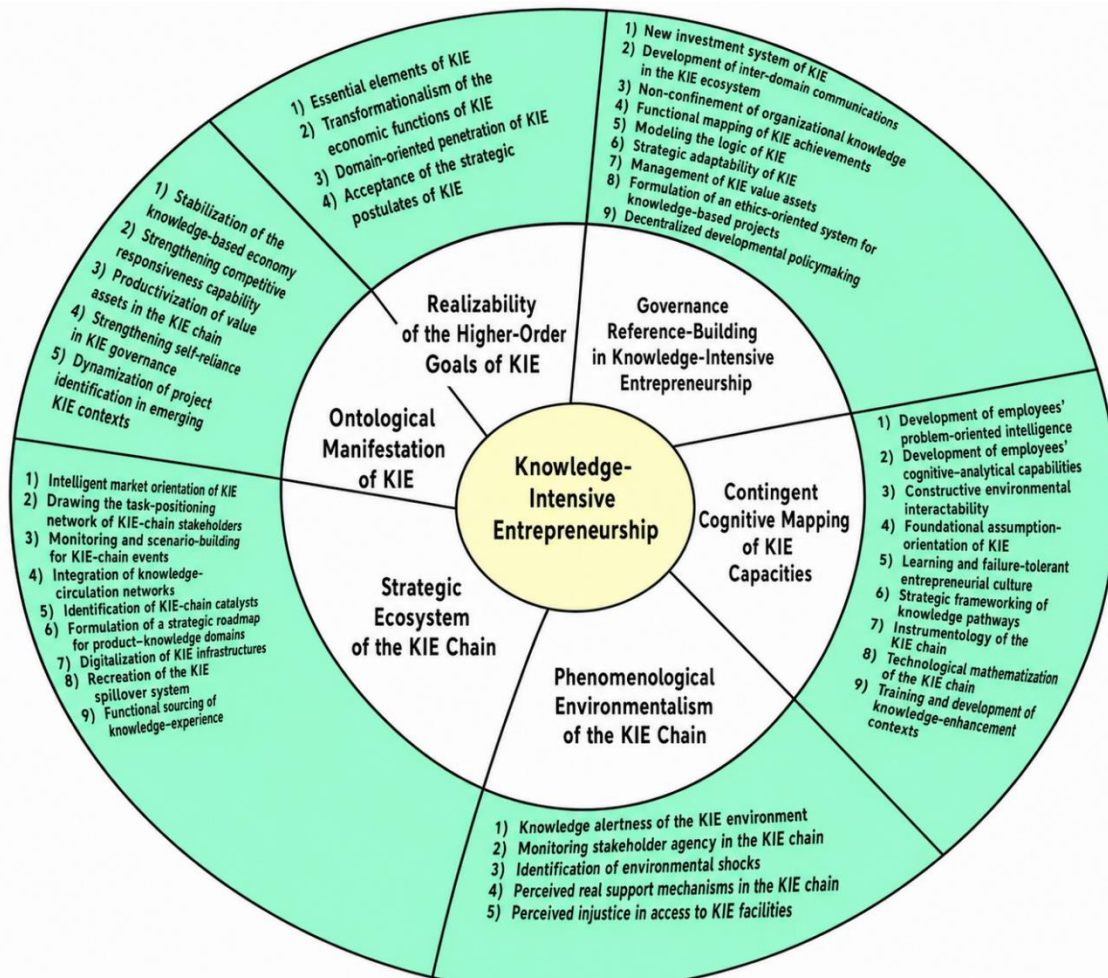
4. Phenomenological environmentalism of the KIE chain: Phenomenological environmentalism of the KIE chain means understanding the knowledge-intensive entrepreneurship chain as a contextual process. Industry needs, social problems, national priorities, technological changes, supportive policies, emerging markets, institutional networks, and stakeholder expectations all play roles in the formation, orientation, and realization of the KIE chain. Therefore, this category emphasizes that any model of knowledge-intensive entrepreneurship must clarify its relationship with the environment, because without understanding the environment, the knowledge-intensive entrepreneurship chain is reduced to a set of scattered research, technological, or commercialization activities. Phenomenological environmentalism of the KIE chain indicates deep reflection on, and perceptibility of, the innovation and technology ecosystem. In this approach, based on the knowledge alertness of the KIE environment, pioneering knowledge-oriented organizations develop environmental sensing capabilities in order to understand the dynamics of the surrounding environment. Such continuous and deep awareness enables monitoring of stakeholder behaviors in the KIE chain so that value-creation flows and the complex network of interactions among different actors can be carefully observed. This phenomenological perspective, through a realistic understanding of catalysts such as perceived real support mechanisms in the KIE chain and the identification of structural barriers such as perceived injustice in access to KIE facilities, provides a holistic, comprehensive, and unrestricted image of the real space of entrepreneurship, which constitutes the basis for any effective agency.
5. Strategic ecosystem of the KIE chain: The strategic ecosystem of the KIE chain is based on the idea that knowledge-intensive entrepreneurship has an ecosystemic nature. To be converted into value, knowledge requires complementary actors, because no organization alone possesses all the elements necessary for knowledge-based value creation. An organization may possess specialized knowledge, but it may still need markets, capital, distribution networks, institutional permits, production capacity, policy legitimacy, scalability capability, or access to users. Therefore, the strategic ecosystem of the KIE chain means the conscious and purposeful design of relationships, roles, and mechanisms that enable knowledge to move from the stage of idea and research to the stage of economic, social, technological, and policy impact. The strategic ecosystem of the KIE chain represents integrated and purposeful intelligence derived from connected networks with the aim of maximizing knowledge spillover flows. Intelligent market orientation of KIE under this category ensures the creation of ideas aligned with realities, latent market needs, and future demand. The sustainability of this broad ecosystem requires drawing the task-positioning network of KIE-chain stakeholders so that, by precisely clarifying roles, any disruptive duplication is prevented and fully organic synergy among different links is formed. This complex structure, relying on monitoring and scenario-building for KIE-chain events, accurately anticipates future pathways and, through the extensive use of

KIE digitalization infrastructures, ensures a transparent, frictionless, and real-time flow of information through the integration of knowledge-circulation networks.

6. Realizability of the higher-order goals of KIE: Realizability of the higher-order goals of KIE represents the ultimate end and ideal-oriented aspect of knowledge-intensive entrepreneurship, which seeks to create deep, systemic, and lasting effects within the structure of society. This category is, in fact, the full manifestation of stabilizing the knowledge-based economy, in which knowledge becomes the primary and unrivaled driver of wealth creation in the macroeconomy and ensures national resilience against severe global shocks. Achieving these ideal goals depends on strengthening competitive responsiveness capability so that the ecosystem can endure in turbulent domestic markets and also capture innovation leadership in regional and international markets. Through productivizing the value assets of the KIE chain, knowledge-oriented organizations transform intangible intellectual capital into dynamic engines of value creation and, by strengthening self-reliance in KIE governance, stabilize the strategic independence of the ecosystem for guiding the path of development without restrictive external dependencies.

Figure 1

Knowledge-Intensive Entrepreneurship Model in the Academic Center for Education, Culture and Research



Discussion and Conclusion

The findings of the present study led to the design of a knowledge-intensive entrepreneurship (KIE) model for the Academic Center for Education, Culture and Research (ACECR), consisting of 129 basic themes, 41 organizing themes, and 6 global themes: ontological manifestation of KIE, governance reference-building in knowledge-intensive entrepreneurship, contingent cognitive mapping of KIE capacities, phenomenological environmentalism of the KIE chain, the strategic ecosystem of the KIE chain, and the realizability of the higher-order goals of KIE. The first finding, namely the ontological manifestation of KIE, indicates that knowledge-intensive entrepreneurship in a research-oriented organization should be understood not merely as a commercialization mechanism or a supplementary economic activity, but as a fundamental redefinition of organizational identity. In this interpretation, ACECR is not only a producer of scientific knowledge but also an entrepreneurial actor capable of transforming knowledge into socioeconomic value. This result is consistent with the knowledge spillover theory of entrepreneurship, which emphasizes that knowledge remains incomplete and underutilized unless it is activated through entrepreneurial agency and converted into innovation, opportunity, and value [5, 7, 8]. The finding also aligns with recent arguments that knowledge-intensive entrepreneurship requires a deeper conceptualization of knowledge as a developmental resource embedded in social, institutional, and economic systems [35, 48]. Therefore, the ontological dimension of the proposed model confirms that KIE begins with a shift in how the organization defines the meaning, role, and destiny of knowledge.

The second major finding concerned governance reference-building in knowledge-intensive entrepreneurship. This theme shows that KIE cannot be realized through dispersed research projects, individual creativity, or isolated technology transfer activities alone; rather, it requires a governance architecture capable of coordinating actors, rules, resources, ethical principles, investment decisions, knowledge assets, and stakeholder relationships. This finding is supported by studies on entrepreneurial universities and knowledge institutions, which argue that the transformation of universities and research organizations into entrepreneurial actors depends on governance reform, incentive structures, technology transfer mechanisms, and institutional legitimacy [13-16]. The present finding also corresponds with studies emphasizing the role of public investment, policy tools, and entrepreneurial support mechanisms in enabling knowledge spillovers and innovation outcomes [6, 12, 43]. In this regard, governance reference-building in ACECR means that the organization must move beyond conventional administrative coordination and create a reference-setting system that links research capacity, national priorities, resource allocation, ethical regulation, and commercialization pathways. Such a system can prevent the fragmentation of knowledge outputs and can help ensure that knowledge-based entrepreneurial action is both strategically coherent and socially responsible.

The third finding, contingent cognitive mapping of KIE capacities, highlights the importance of identifying, interpreting, and aligning internal organizational capacities with entrepreneurial opportunities and environmental demands. This theme suggests that research-oriented organizations require a dynamic cognitive map of their knowledge assets, human capabilities, technological resources, institutional routines, network relations, and hidden capacities. The result is aligned with the literature on absorptive capacity and knowledge-intensive entrepreneurship, which shows that organizations must be able to recognize valuable knowledge, assimilate it, combine it with prior competencies, and apply it to opportunity development and innovation [20-22]. Moreover, the emphasis on employee competencies, problem-oriented intelligence, and knowledge-sharing culture is consistent with evidence that knowledge-based entrepreneurship in higher education institutions depends

strongly on employee capabilities and organizational knowledge-sharing practices [23]. The finding also corresponds with studies showing that knowledge-intensive entrepreneurial activity is shaped by relational learning, homophilic knowledge ties, and the mobility of knowledge-intensive entrepreneurs across ecosystems [24, 25]. Thus, the proposed model suggests that ACECR should not treat capacity as a static resource inventory, but as a continuously updated cognitive and strategic representation of what the organization knows, what it can do, and how its knowledge can be transformed into value.

The fourth finding, phenomenological environmentalism of the KIE chain, indicates that the knowledge-intensive entrepreneurship process must be understood in relation to the environment in which it emerges. The participants' accounts showed that industry needs, national problems, market expectations, technological shifts, stakeholder behaviors, economic fluctuations, investment risks, and unequal access to facilities all shape the KIE chain. This result is consistent with ecosystem-based studies that emphasize the contextual, regional, and institutional embeddedness of entrepreneurial knowledge spillovers [10, 11, 26]. It also aligns with research showing that knowledge economies are shaped by spatial dynamics, local labor markets, internal migration, regional competition, industrial clusters, and cross-border spillovers [2, 4, 42]. From this perspective, ACECR's KIE model cannot be designed only around internal scientific capabilities; it must also include environmental sensing, stakeholder monitoring, risk recognition, and realistic evaluation of ecosystem support. The finding further supports the idea that knowledge-intensive entrepreneurship is not merely a linear movement from research to commercialization, but a situated, adaptive, and environmentally responsive process.

The fifth finding, the strategic ecosystem of the KIE chain, shows that KIE requires a deliberate ecosystem architecture through which knowledge can move from research and idea generation toward economic, technological, social, and policy impact. This theme includes intelligent market orientation, stakeholder task positioning, risk monitoring, scenario-building, digitalization, integration of knowledge-circulation networks, knowledge spillover system recreation, and functional sourcing of knowledge–experience. These findings are strongly supported by studies emphasizing that innovation ecosystems depend on networked interactions among universities, firms, governments, markets, investors, technology transfer institutions, and digital infrastructures [18, 19, 40, 41]. They also align with evidence on technology transfer, foreign direct investment, knowledge-intensive services, and coworking spaces, which shows that entrepreneurial value creation depends on intermediary mechanisms and spatial–organizational linkages that facilitate knowledge circulation [27-29]. Furthermore, the emphasis on digital infrastructures and digitalized knowledge flows corresponds with studies on digital-intensive business models, digital resilience, the digital economy, and high-quality development in the knowledge economy [3, 30, 31]. Accordingly, the proposed model implies that ACECR should act as an ecosystem orchestrator that connects knowledge production with market intelligence, digital platforms, stakeholder networks, and strategic foresight.

The sixth finding, realizability of the higher-order goals of KIE, demonstrates that the ultimate purpose of knowledge-intensive entrepreneurship is not limited to revenue generation or the establishment of knowledge-based firms, but includes the stabilization of the knowledge-based economy, strengthening competitive responsiveness, productivizing intellectual assets, reinforcing knowledge-based self-reliance, and enabling active project identification in emerging domains. This result is consistent with studies that connect knowledge-intensive entrepreneurship with sustainable value creation, circular economy entrepreneurship, green innovation, agricultural entrepreneurship literacy, and frugal innovation for sustainable human development [32, 36-38]. It also aligns with research on knowledge-based entrepreneurship programs and innovation-based SME transformation, which demonstrates that knowledge entrepreneurship can support learning, innovation,

sustainability, and economic transformation when embedded in supportive institutional systems [33, 34, 39]. The emphasis on developmental value creation is also compatible with studies on regional youth employment, university entrepreneurial ecosystems, and student entrepreneurial intention, which highlight the broader socioeconomic functions of knowledge-based entrepreneurship [17, 44]. Therefore, the present model positions KIE as a mechanism for achieving strategic, social, and national development goals through the systematic activation of knowledge.

Taken together, the findings suggest that knowledge-intensive entrepreneurship in ACECR should be interpreted as a multidimensional institutional logic rather than a single organizational program. The proposed model integrates identity transformation, governance, cognitive capability development, environmental responsiveness, ecosystem orchestration, and higher-order value creation. This integrated view contributes to the literature by showing that a research-oriented organization can play several roles simultaneously: knowledge producer, ecosystem coordinator, policy-oriented actor, entrepreneurial catalyst, technology developer, and value-creation agent. This interpretation extends previous studies that have separately examined entrepreneurial universities, knowledge spillovers, absorptive capacity, technology transfer, entrepreneurial ecosystems, and sustainable entrepreneurship by bringing these dimensions together in a coherent organizational model [1, 29, 49, 50]. The model also resonates with Iranian studies on entrepreneurial ecosystem evaluation, employment capability for knowledge-based businesses, and open-data governmental ecosystems, which point to the importance of context-sensitive frameworks for developing knowledge-based entrepreneurship in national and organizational settings [45-47]. Hence, the central contribution of this study is that it provides a contextually grounded and theoretically supported model through which ACECR can transform its knowledge resources into entrepreneurial, economic, and social outcomes.

This study has several limitations that should be considered when interpreting the findings. First, the study was conducted qualitatively and relied on semi-structured interviews with a limited number of academic and organizational experts; therefore, although theoretical saturation was achieved, the findings should not be generalized statistically to all research-oriented organizations. Second, the study focused specifically on ACECR, and its institutional mission, governance structure, organizational culture, and national role may differ from those of universities, private research institutes, science and technology parks, or purely commercial knowledge-based firms. Third, the findings are based on expert perceptions and interpretations, which may be influenced by organizational experience, professional position, and subjective understanding of knowledge-intensive entrepreneurship. Fourth, the proposed model has not yet been tested quantitatively or longitudinally, and its practical effectiveness requires further empirical validation.

Future studies are recommended to test the proposed model quantitatively using structural equation modeling or other multivariate techniques in order to examine the relationships among the identified dimensions and determine their relative effects on knowledge-intensive entrepreneurship outcomes. Comparative studies can also be conducted across universities, research institutes, science and technology parks, innovation centers, and knowledge-based firms to assess the transferability of the model in different institutional contexts. Longitudinal research would be valuable for examining how the implementation of the model affects commercialization, innovation performance, knowledge spillovers, stakeholder engagement, and socioeconomic value creation over time. In addition, future research may develop measurement scales for the six main dimensions of the model and examine how organizational culture, leadership style, digital infrastructure, governance quality, and environmental turbulence influence the success of knowledge-intensive entrepreneurship.

Managers and policymakers in ACECR should use the proposed model as a strategic roadmap for transforming research outputs into knowledge-based entrepreneurial value. To this end, it is necessary to establish formal governance mechanisms for KIE, strengthen technology transfer and commercialization units, create integrated knowledge repositories, support interdisciplinary research teams, and design incentive systems that encourage researchers and employees to participate in entrepreneurial activities. ACECR should also develop systematic environmental monitoring mechanisms to identify national problems, industry needs, emerging markets, and technological opportunities. At the operational level, the organization should invest in employee training, cognitive–analytical capability development, digital infrastructure, stakeholder networking, and ethical regulation of knowledge-based projects. By doing so, ACECR can move from fragmented research activities toward an integrated knowledge-intensive entrepreneurship ecosystem capable of supporting innovation, self-reliance, and sustainable socioeconomic value creation.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Written consent was obtained from all participants in the study.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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