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Designing a Qualitative Model of Knowledge Creation with an Innovative Approach in North Khorasan Islamic Azad Universities

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ABSTRACT

Objective: Taking into account the critical significance of generating innovative concepts and the necessity for universities to embrace fresh ideas and inventive theories, it is anticipated that academic institutions and research environments will transcend conventional frameworks and adjust to the evolving demands of society, thereby establishing an appropriate foundation for the generation of knowledge. The objective of the present study is to formulate a knowledge creation model employing an open innovation paradigm within the Islamic Azad Universities of North Khorasan.

Methods: This investigation employs a qualitative methodology. The targeted demographic for this study comprised scholarly experts who possessed insights in the domains of executive management and human resources, had attained a university education, and were selected through purposive sampling techniques.

Results: The results of the study revealed that the proposed knowledge creation model is comprised of seven dimensions, which include socialization, externalization, content factors, composition, structural factors, internalization, and cognitive aspects.

Conclusions: Overall, the knowledge creation model featuring redefined innovation presented in this research demonstrates substantial validity and can effectively inform the policies and strategies pertaining to knowledge generation within universities and institutions of higher education.

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Introduction

The process of knowledge creation serves as the fundamental impetus for sustainable performance, while the organization's capacity to cultivate relationships and collaborate with other entities, as well as to uphold its competitive edge, is imperative (Oktari et al., 2021). The organization has the potential to foster an environment where employees are encouraged to engage in independent thought, share their insights and perspectives transparently with their peers, and pursue unconventional alternatives through structured formality and innovation (Roshanzadeh et al., 2021). For instance, rewarding and promoting innovative ideas from employees, facilitating open discussions regarding organizational experiences and failures, and fostering the establishment of learning groups within the organization enhances the process of knowledge creation (Alwani, 2021). Indeed, the creation of knowledge significantly contributes value to higher education and represents a viable source of sustainable competitive advantage (Lee & Schottenfeld, 2014).

Research and studies conducted within the domains of education and training indicate that in higher education institutions and universities—recognized as educational and cultural entities and as pivotal centers for transformation and development within the nation—insufficient emphasis has been placed on innovation, and the components and dimensions of knowledge innovation have not been articulated effectively. Consequently, the formulation of a knowledge creation model that encompasses relevant dimensions and components tailored to universities has the potential to metamorphose these institutions into innovative organizations (Frank & Meyer, 2007). Open innovation constitutes a holistic methodology for managing innovation that is actively promoted and routinely investigated, encompassing a broad spectrum of internal and external sources for identifying innovation opportunities, characterized as the deliberate amalgamation of prospects, the exploration of resources and capabilities, and the comprehensive exploitation of opportunities through diverse channels. Such institutions may leverage open innovation to acquire supplementary knowledge, establish new industry standards, and broaden their market reach for products and services (Masucci et al., 2020). Open innovation represents a novel paradigm that significantly challenges conventional approaches to innovation management and stands as a contemporary issue within management science (Huizingh, 2011). Open innovation entails the advantageous and intentional utilization of innovation, ideas, and both internal and external knowledge of the organization to expedite the internal innovation processes and value generation

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within the organization (Elmquist et al., 2009), as well as the comprehension of the structures and processes that facilitate open innovation, which includes knowledge management strategies at the organizational level (Miguélez et al., 2011) and human resource considerations (Engelsberger et al., 2022).

The implementation of open innovation within universities, acknowledged as key contributors to innovation, is of paramount significance for the purpose of gathering authentic data from both internal and external environments and converting it into knowledge, thereby ensuring survival in a highly dynamic external setting (Abdul Razak et al., 2014).

In the Islamic Republic of Iran, minimal scholarly exploration has been conducted on this subject within academic institutions, including Islamic Azad University. In 2021, universities in North Khorasan were positioned 67th out of a total of 279 private universities. To date, there exists no recorded data pertaining to the entrepreneurship departments of the Bojnord branch of Islamic Azad University, which encompasses innovation centers, science and technology parks, accelerators, growth centers, co-working spaces, and startups within the entrepreneurial ecosystem of Iran. Furthermore, it is pertinent to note that the proliferation of the coronavirus, as a pervasive crisis, has impeded the operations of industry and commerce; consequently, organizational methodologies and higher education paradigms must undergo transformation in the aftermath of its spread. Amidst the alteration of educational delivery methods, assessments, and other related activities, there has been a significant impact on students, faculty, and human resources associated with the universities. Therefore, in pursuit of their objectives and the execution of their strategies, universities are compelled to adopt effective measures pertaining to human resource management. Additionally, they must not only recognize themselves and the influential environmental factors but also acquire the capacity to adapt to external changes, thereby optimizing their strengths and leveraging opportunities to navigate the situation most effectively by addressing environmental weaknesses and potential threats.

With regard to the creation of knowledge and the concept of open innovation, numerous studies have been conducted both domestically and internationally; however, a majority of these investigations are predominantly situated within the economic sector and commercial entities, with comparatively scant research focused on knowledge creation and open innovation within educational organizations, particularly in universities, given their distinctive role and significance.

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In a study, Arabshahi et al. (2022) examined the influence of the knowledge valuation of top executives on knowledge-sharing methodologies, open innovation, and organizational performance. The statistical sample for the present study comprised the managers of 153 technology and knowledge-based firms located within the growth center of Ferdowsi University in Mashhad. From this population, 110 samples were identified through Cochran's formula and were subsequently selected using a sampling method. The findings indicated that the valuation of knowledge held by top management exerts an influence on knowledge-sharing methodologies. Open innovation was found to have a positive and statistically significant effect on organizational performance, with a path coefficient of 0.381 and a T-statistic of 3.706; however, open innovation did not demonstrate a significant impact on organizational performance with a path coefficient of 0.186 and a T-statistic of 1.342.

Salehian et al. (2021) conducted a scholarly investigation into the influence of open innovation on innovation performance, specifically by examining the mediating role of innovation strategy and knowledge sharing. The research sample comprised 98 managers from the Mobarakeh Steel Company located in Isfahan. The outcomes of the study indicated that the highest beta coefficient (0.736) corresponded to the pathway from open innovation to knowledge sharing, while knowledge sharing and innovation strategy exhibited a comprehensive direct relationship with the connection between open innovation and innovation performance, with a direct value of 0.367 and an indirect mediation value of 0.381, yielding an overall value of 0.748.

Badin Dahesh et al. (2021) undertook an analysis of academic social networks pertaining to the domain of open innovation. This study involved the examination of 2099 open innovation documents that were published on the Ava Science website from 2003 to 2018. The findings revealed that there has been a significant increase in the volume of research associated with open innovation since 2014. Furthermore, it was noted that the concepts and topics relevant to the field of open innovation have remained largely unchanged. The United States has emerged as the leading contributor of documents related to open innovation, while Iran ranks 46th with a total of 5 documents.

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Seifollahi and Hamidzadeh Arbabi (2021) examined the impact of knowledge management and market orientation on market performance, incorporating the mediating role of open innovation, with a research sample drawn from Tejarat Bank. The statistical population for this research comprised employees, experts, and managers from Iran Bank Tejarat District 5 in Tehran, from which 242 individuals were selected utilizing random sampling in accordance with Morgan's table. The findings indicated that knowledge management and open innovation exert a direct influence on market performance. Additionally, knowledge management and market orientation were found to have a significant indirect effect on market performance through the intermediary of open innovation, in addition to their direct impact.

Babaee Farsani et al. (2021) explored the interaction of open innovation with absorption capacity, leadership, and the organizational learning culture within knowledge-based enterprises, employing a moderated mediation model. This research was conducted with the participation of 131 managers and experts from knowledge-based companies in the Chaharmahal and Bakhtiari provinces, who were selected through random sampling and in accordance with Morgan's table. The findings highlighted that the highest coefficient of determination was associated with the pathway from empowering leadership to organizational learning culture. Moreover, the organizational learning culture was found to fully mediate the relationship between empowering leadership and both internal and external open innovation.

(Namayandeh et al., 2024), through the design of a knowledge management model predicated on the open innovation paradigm within academic institutions, articulated the outcomes derived from the examination of information, dimensions, and fundamental components of knowledge management as it relates to the open innovation approach in academic centers. This framework encompasses four dimensions: technology, process and structure, culture, and human capital and work, in addition to twelve components and forty-four indicators being duly enumerated.

Gurca et al. (2021), in their scholarly work entitled "Managing Open Innovation Challenges from Businesses to Businesses in Complex Projects: A Multistage Process Model," posited that open innovation within intricate projects engenders various challenges. Knowledge dissemination and system integration emerge as two predominant challenges instigated by the demand for business transparency amid complex innovation endeavors. By enhancing organizational capabilities pertinent to the management of complex projects, it becomes feasible to augment innovation in

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requisite actions and functions, thereby bolstering the internal preparedness of enterprises to oversee open innovation.

In the research undertaken by Xiong et al. (2022), which posed the inquiry, "How can open innovation ecosystem modes drive product innovation?," the findings illuminated that three specific combinations elucidate a heightened level of product innovation: 1. inter-firm cooperation, inter-firm collaboration, and technology transfer coupled with asset disclosure; 2. inter-company cooperation, intermediary company collaboration, and technology transfer in conjunction with university-institute-company cooperation; 3. inter-company cooperation, intermediary company collaboration, and institution-university cooperation, augmented by user company collaboration.

In prior investigations concerning knowledge creation and open innovation, various dimensions and components have been delineated; however, no research has been conducted that offers a comprehensive model suitable for knowledge creation and open innovation within the context of universities. Thus, the principal objective of this research is to develop an appropriate model for knowledge creation utilizing open innovation within the Islamic Azad Universities of North Khorasan.

Consequently, it is imperative to devise and propose an appropriate model that aligns with the institutional contexts of Iranian academic institutions; robust knowledge management and knowledge innovation will only be attainable when an appropriate framework for innovation is established, allowing intellectual resources to engage creatively within the organization to foster a proper interaction with the external environment for the provision of knowledge products; In essence, leveraging the open innovation paradigm is essential for the vibrancy of knowledge-based organizations, particularly universities, and holds significant importance. Conversely, due to the absence of a knowledge creation model grounded in open innovation within universities and its practical application, these knowledge organizations remain oblivious to numerous knowledge activities and are unable to disseminate their knowledge and knowledge creation capabilities, thereby hindering effective innovations for the advancement of the nation; consequently, this current research has become imperative to address such a necessity; thus, the present study aims to resolve the fundamental inquiry regarding what constitutes an appropriate model for the implementation of knowledge creation based on the open innovation framework within academic centers.

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Material and Methods

The present study was undertaken with the objective of formulating a qualitative model of knowledge generation utilizing an open innovation paradigm within academic institutions. This qualitative inquiry is predicated upon specific objectives, applications, and developmental goals, which endeavor to delineate the dimensions and constituents of knowledge generation and open innovation in higher education establishments. The research methodology has been executed in two concurrent phases as follows; in the initial phase, scholarly resources, documents, publications, and reputable articles pertinent to the fields of knowledge generation and open innovation have been utilized to establish the conceptual framework of the investigation, and in the subsequent phase, the researcher has endeavored to ascertain the dimensions and components of knowledge generation and open innovation by gathering requisite information through bibliographic research, employing books and publications, conducting searches in online databases, and reviewing both domestic and international articles, theoretical foundations, and exploratory interviews. Consequently, a Delphi group was constituted, and upon the completion of three rounds of the Delphi technique, the dimensions and components were discerned. The statistical population and research sample consisted of 22 academic and administrative experts, selected through purposive sampling based on criteria such as academic title, role as a guide or advisor for university theses in the domain of organizational management, possession of published works in reputable scientific and research journals, and adequate comprehension of academic matters. Furthermore, the group of administrative experts was composed of senior managers who possess a minimum of 10 years of professional experience.

Results

According to the findings, the predominant composition of the expert panel consists of male respondents, accounting for 73%, while female respondents constitute a mere 27% of the participating experts. Furthermore, the findings indicated that 22 members of the expert group possess specialized doctorate degrees, whereas 4 individuals hold master's degrees. In the initial phase of the Delphi project, a questionnaire encompassing the dimensions and components derived for the formulation of a knowledge creation model utilizing an open innovation perspective was distributed to the Delphi panel, or the members of the expert group, to solicit their opinions and

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insights regarding the significance and relevance of the presence of each dimension and component. This stage identified a total of 8 dimensions and 64 components for the aforementioned model; these were extracted based on theoretical foundations, existing literature, and historical research both domestically and internationally, and subsequently presented to the members of the Delphi panel (comprising 26 experts) for their evaluation. Consequently, 6 dimensions and 49 components pertaining to the knowledge creation variable, along with 2 dimensions and 15 components related to the innovation variable, were extracted and compiled.

Table 1. Frequency distribution of experts' views regarding the dimensions of the knowledge creation model with an open innovation approach in the first stage of the Delphi technique.

Concept (variable)	Dimension	Agree		Disagree		Result
		Frequency	%	Frequency	%	
Knowledge creation	socialization	26	100	0	0	Positive
	Organizational factors	25	96	1	4	Positive
	externalization	24	94	2	8	Positive
	internalization	24	92	2	8	Positive
	cognitive	23	88	2	12	Positive
	combination	22	85	4	15	Positive
Suggestion	The dimension of organizational factors should be divided into two dimensions: "structural factors" and "content factors."					
Open innovation	Outside-in process	25	94	1	4	Positive
	Inside-out process	24	92	2	8	Positive
Suggestions	The name of the outside-in process dimension should be changed to "Introduction of knowledge and technology to the university." The name of the inside-out process dimension should be changed to "Knowledge and Technology Exit from the University." The dimension of "new technology sharing" should be added to the dimensions of open innovation.					

In the subsequent phase of the Delphi technique, an additional questionnaire was meticulously formulated and assembled in accordance with the outcomes and insights derived from the preliminary Delphi phase. Specifically, in the questionnaire pertaining to the second phase, the participating experts were solicited to articulate their perspectives and assessments concerning each of the dimensions and components that had been sanctioned in the initial phase, utilizing a Likert scale comprising five options ranging from "strongly agree" to "strongly disagree." Following the aggregation and analysis of the opinions and assessments provided by the members of the Delphi panel with respect to each of the variables that emerged from the first phase of Delphi; the dimensions and components that achieved an average score exceeding 4, along with a

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consensus of at least 70% among the expert members, were retained, while those variables that scored 4 or below were excluded from the research model. Ultimately, at the conclusion of this stage, a total of 10 dimensions and 67 components were duly ratified by the Delphi panel members for the knowledge creation model incorporating an open innovation approach.

In the third stage of the Delphi technique, all dimensions and components under scrutiny (comprising 10 dimensions and 67 components) attained an average score surpassing 4, with a minimum of 70% agreement from the Delphi panel members concerning all dimensions and components (wherein at least 70% of the experts' responses indicated agreement or strong agreement) thus no dimensions or components were omitted at this juncture, and from the perspective of the expert panel, these were deemed to possess the requisite influence and significance for inclusion in the research model. Consequently, the knowledge creation model featuring an open innovation approach within North Khorasan Azad Universities was ultimately finalized, comprising 67 components and 10 dimensions, wherein 7 dimensions and 50 components were designated for the variable of knowledge creation, alongside 3 dimensions and 17 components for open innovation that were likewise finalized and endorsed. Table 2 presents descriptive indices and inferential statistics based on the perspectives and assessments of the expert group members regarding the dimensions of the knowledge creation model with an open innovation approach within the Islamic Azad Universities of North Khorasan, alongside the content validity ratio and the consensus index. Moreover, in Table 3, descriptive indicators and inferential statistics predicated upon the opinions and perspectives of the members of the expert group. Pertaining to the elements of each dimension of knowledge creation, the content validity ratio and consensus index have been described.

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Table 2. Descriptive indices and inferential statistics of the dimensions of the knowledge creation model with an open innovation approach along with the content validity ratio and consensus index

Concept (variable)	Dimension	Descriptive indices		Inferential indices			consensus indexes			Result
		Mean	SD	T value	DF	P	CVR	CI (-2 to +2)		
Knowledge creation	Socialization	4.68	0.48	6.71	21	0.001	1	1.77		Confirmed
	Externalization	4.77	0.43	8.45	21	0.001	1	1.64		Confirmed
	Content factors	4.64	0.49	6.06	21	0.001	1	1.68		Confirmed
	Combination	4.68	0.48	6.71	21	0.001	1	1.59		Confirmed
	Structural factors	4.59	0.50	5.51	21	0.001	1	1.55		Confirmed
	Internalization	4.55	0.51	5.02	21	0.001	1	1.64		Confirmed
	Cognitive	4.64	0.58	5.14	21	0.001	0.90	1.73		Confirmed
Open innovation	Entry of knowledge and technology to the university	4.73	0.46	7.48	21	0.001	1	1.86		Confirmed
	Share new technology	4.86	0.35	11.53	21	0.001	1	1.59		Confirmed
	The exit of knowledge and technology from the university	4.59	0.59	4.70	21	0.001	0.90	1.50		Confirmed

Table 3. Descriptive indices and inferential statistics of knowledge creation dimensions along with content validity ratio and consensus index

Dimension	Component	Descriptive indices		Inferential indices		Consensus indexes		Result
		Mean	SD	T value	P	CVR	CI (-2 to +2)	
Socialization	The employees try to get to know each other's experiences	4.50	0.51	4.58	0.001	1	1.68	Confirmed
	Sharing personal knowledge related to work	4.68	0.57	5.63	0.001	0.90	1.50	Confirmed
	Team building and networking	4.50	0.67	3.48	0.002	0.80	1.64	Confirmed
	Transferring organizational knowledge to managers	4.64	0.58	5.13	0.001	0.90	1.36	Confirmed
	Exchange of employees' opinions about university problems	4.36	0.66	2.59	0.01	0.80	1.41	Confirmed
	Informing employees about university problems	4.41	0.67	2.88	0.009	0.80	1.45	Confirmed
	Acquisition of information and knowledge from interactive networks	4.45	0.60	3.57	0.002	0.90	1.45	Confirmed
Externalization	Mention concrete examples in describing job issues	4.45	0.67	3.17	0.005	0.80	1.55	Confirmed
	Dissemination of knowledge outside the university	4.55	0.51	5.02	0.001	1	1.41	Confirmed
	Providing solutions related to the needs of the beneficiaries	4.41	0.67	2.88	0.009	0.80	1.41	Confirmed
	Scientific communication at the national and international level	4.41	0.73	2.61	0.01	0.70	1.36	Confirmed

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	International conferences, meetings and exhibitions	4.36	0.66	2.59	0.01	0.80	1.64	Confirmed
	Consultation with competent and expert people in connection with university ideas	4.64	0.58	5.13	0.001	0.90	1.55	Confirmed
	Attention and emphasis on the development of new knowledge about the needs of the beneficiaries	4.55	0.60	4.29	0.001	0.90	1.41	Confirmed
Combination	Valuing creativity and new ideas	4.41	0.73	2.61	0.01	0.70	1.62	Confirmed
	Emphasis on the development of university entrepreneurship	4.62	0.50	5.70	0.001	0.90	1.68	Confirmed
	Continuous improvement and strengthening of technical knowledge in the university	4.68	0.57	5.63	0.001	0.90	1.59	Confirmed
	Improving and strengthening the methods of creating ideas in the university	4.59	0.59	4.69	0.001	0.90	1.55	Confirmed
	Improving the participation methods in the university	4.55	0.51	5.02	0.001	1	1.52	Confirmed
	Combining internal and external knowledge	4.52	0.68	3.53	0.002	0.70	1.50	Confirmed
Internalization	Learning by doing and doing tasks	4.50	0.67	3.48	0.002	0.80	1.45	Confirmed
	Communication and information sharing	4.45	0.67	3.17	0.005	0.80	1.50	Confirmed
	Acquiring practical skills through university training and empowerment programs	4.50	0.60	3.92	0.001	0.90	1.59	Confirmed
	Turning personal knowledge into ideas and work experiences	4.59	0.50	5.50	0.001	1	1.41	Confirmed
	Gaining skills through the use of new software and virtual spaces	4.41	0.59	3.25	0.004	0.90	1.52	Confirmed
	Transferring the experience and skills of university experts and specialists to other employees	4.52	0.68	3.53	0.002	0.70	1.59	Confirmed
	Conducting trial and error related to general knowledge in the university	4.59	0.67	4.16	0.001	0.80	1.45	Confirmed
Cognitive	Awareness of knowledge	4.45	0.67	3.17	0.005	0.80	1.64	Confirmed
	Mental maps	4.64	0.49	6.02	0.001	1	1.45	Confirmed
	Interpretation processes	4.45	0.51	4.18	0.001	1	1.36	Confirmed
	cognitive space	4.36	0.66	2.59	0.01	0.80	1.52	Confirmed
	Knowledge perception	4.52	0.60	3.99	0.001	0.80	1.73	Confirmed
	Conceptualization	4.73	0.46	7.48	0.001	1	1.41	Confirmed
	Determining the required knowledge	4.41	0.73	2.61	0.01	0.70	1.52	Confirmed
Structural	Low formality	4.52	0.68	3.53	0.002	0.70	1.36	Confirmed
	The existence of organizational complexity in the university	4.36	0.49	3.46	0.002	1	1.41	Confirmed
	Decentralized decision making system	4.41	0.67	2.88	0.009	0.80	1.55	Confirmed
	The amount of duties and responsibilities	4.55	0.60	4.29	0.001	0.90	1.41	Confirmed

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	The flexibility of the university structure	4.41	0.59	3.25	0.004	0.90	1.62	Confirmed
	Manpower recruitment and development system	4.62	0.59	4.81	0.001	0.80	1.38	Confirmed
	Training and empowering employees (enabling structure)	4.38	0.50	3.50	0.002	0.90	1.55	Confirmed
Content	Organizational culture of knowledge creators	4.55	0.60	4.06	0.001	0.70	1.45	Confirmed
	Access to information sources	4.45	0.60	3.57	0.002	0.90	1.64	Confirmed
	Equipment, facilities and physical space	4.64	0.66	4.53	0.001	0.80	1.65	Confirmed
	Using new technologies in the university	4.65	0.49	5.94	0.001	0.80	1.43	Confirmed
	Having a favorable environment	4.43	0.68	2.90	0.009	0.70	1.68	Confirmed
	Strategy and goals	4.68	0.48	6.70	0.001	1	1.52	Confirmed
	The spirit of research and search	4.52	0.51	4.69	0.001	0.90	1.41	Confirmed
	The atmosphere of criticism in the university	4.41	0.67	2.88	0.009	0.80	1.55	Confirmed
	Interdisciplinary communication	4.55	0.67	3.81	0.001	0.80	1.41	Confirmed

Descriptive indicators and inferential statistics based on the opinions and views of the members of the expert group. With regard to the elements comprising each dimension of open innovation, accompanied by the presentation of the content validity ratio and consensus index, this information is delineated in Table 4.

Table 4. Descriptive indices and inferential statistics of open innovation dimensions along with content validity ratio and consensus index

Dimension	Component	Descriptive indices		Inferential indices		Consensus indexes		Result
		Mean	SD	T value	P	CVR	CI (-2 to +2)	
Entry of knowledge and technology to the university	Stakeholder participation	4.41	0.59	3.25	0.004	0.90	1.48	Confirmed
	External networking	4.48	0.60	3.62	0.002	0.80	1.45	Confirmed
	Using ideas from outside the university	4.45	0.51	4.18	0.001	1	1.45	Confirmed
	Using up-to-date knowledge of customers	4.45	0.67	3.17	0.005	0.80	1.57	Confirmed
	Identifying the external knowledge network (outsourcing knowledge)	4.57	0.51	5.16	0.001	0.90	1.36	Confirmed
	Taking advantage of the ideas of experts outside the university	4.36	0.66	2.59	0.01	0.80	1.50	Confirmed
The exit of knowledge and technology from the university	Commercialization of ideas	4.50	0.51	4.35	0.001	0.80	1.81	Confirmed
	Selling intellectual property	4.81	0.40	9.22	0.001	0.90	1.52	Confirmed
	Transferring the idea to the external environment	4.52	0.60	3.99	0.001	0.80	1.64	Confirmed
	Granting a license to use internal technologies to foreign partners	4.64	0.49	6.06	0.001	1	1.43	Confirmed

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	Creating new companies based on internal knowledge and supporting them	4.43	0.60	3.28	0.004	0.80	1.32	Confirmed
	Protection of intellectual property rights and patent rights	4.32	0.57	2.62	0.01	0.90	1.41	Confirmed
Share new technology	Direct connection between the university and the industry	4.41	0.59	3.25	0.004	0.90	1.38	Confirmed
	Open infrastructures to create shared knowledge	4.38	0.50	3.50	0.002	0.90	1.50	Confirmed
	Reliable data sharing	4.50	0.60	3.92	0.001	0.90	1.70	Confirmed
	Common research operating systems	4.70	0.47	6.65	0.001	0.80	1.71	Confirmed
	Article publishing strategy to share research	4.71	0.46	7.07	0.001	0.90	1.48	Confirmed

Following the execution of three Delphi phases and the consensus of experts concerning the dimensions and elements of knowledge creation and innovation within the universities of the examined community, a qualitative research model was constructed (Figure 1).

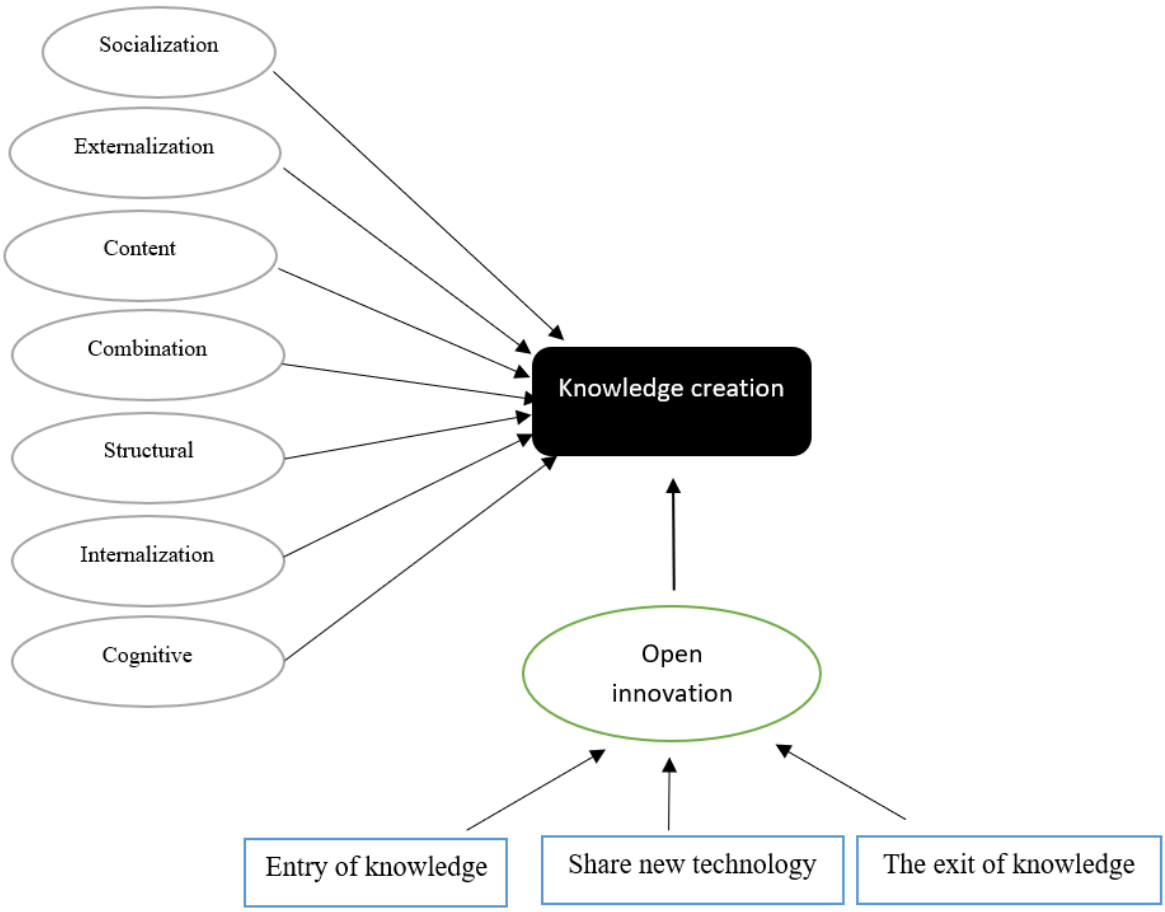

Figure 1. Qualitative research model

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Discussion

In a general sense and predicated upon a comprehensive summary of the outcomes derived from the Delphi methodology (which encompasses the findings from the execution of the three phases of the Delphi technique, the computation of the consensus index coefficient, and the evaluation of the content validity ratio), the final conclusions are drawn from the results obtained through literature review and theoretical foundations, in conjunction with the perspectives and insights of the group members. Experts engaged in various phases of the Delphi technique, particularly during the final phase (the third phase of the Delphi technique); the model for knowledge creation incorporating an open innovation approach within the Islamic Azad Universities of North Khorasan is characterized by 10 dimensions and 67 components; such that 7 dimensions and 50 components were employed to assess and evaluate the knowledge creation variable within the aforementioned model, while 3 dimensions and 17 components were utilized to gauge open innovation, which collectively constitutes the research model. Consequently, all analyses, responses to the research inquiries, and the validation of the conceptual model of this study were conducted among the professors and administrators of the Islamic Azad Universities located in North Khorasan province, in accordance with the previously mentioned dimensions and components derived from the Delphi project.

In the context of dynamic knowledge economies, this study's findings hold significant relevance for enhancing the role of universities as hubs of innovative knowledge creation (Spraggon & Bodolica, 2008). The designed model, grounded in the open innovation paradigm, contributes a fresh perspective to knowledge generation processes within Islamic Azad Universities in North Khorasan, enabling these institutions to move beyond traditional academic frameworks. Given the heightened importance of adaptive knowledge models in an era marked by rapid technological advancements, the study's model offers a practical structure for universities seeking to foster an innovative environment conducive to social and economic development.

The model's seven dimensions—socialization, externalization, content factors, composition, structural factors, internalization, and cognitive aspects—present a comprehensive framework for understanding the nuanced processes of knowledge creation within academic settings. For instance, socialization and externalization serve as conduits for transforming implicit knowledge into explicit forms, fostering collaboration and cross-disciplinary engagement among academic

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and administrative personnel (Purcarea et al., 2013). The inclusion of structural factors acknowledges the need for organizational support systems that underpin these knowledge-sharing activities. Internalization, meanwhile, emphasizes the cycle through which explicit knowledge is absorbed and transformed into personal insights, ready for future application and innovation.

These findings support the idea that universities, particularly those within the Islamic Azad University network, can serve as pivotal centers for societal transformation by leveraging open innovation principles. The proposed model is not only practically valuable for shaping university policies but also theoretically significant as it addresses the alignment between knowledge management practices and the evolving requirements of the knowledge society. This model could serve as a benchmark for similar institutions aiming to improve their knowledge creation and dissemination capabilities, ensuring that they remain relevant contributors to societal development in a knowledge-driven world.

This study, while offering a valuable model for knowledge creation within universities, faces several limitations. First, the qualitative nature of the research, while providing in-depth insights, restricts the generalizability of the findings beyond the specific context of Islamic Azad Universities in North Khorasan. Additionally, the purposive sampling method, which focused on selecting participants with expertise in executive management and human resources, may limit the diversity of perspectives, potentially overlooking insights from other academic and administrative roles that could enrich the model. The model's emphasis on open innovation and the identified dimensions also reflects the current organizational and cultural context of these universities, which may differ from other institutions, both within and outside of Iran. Future research may address these limitations by employing a mixed-methods approach, including a more extensive sample and quantitative validation, to further refine and expand the applicability of the knowledge creation model across different educational and cultural settings.

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Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the ethics committee of Islamic Azad University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection, and analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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