

## Original Article

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## HOW TO CITE THIS ARTICLE

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## Policies for developing collaboration between urban management actors in the entrepreneurial ecosystem of Tehran

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### Abstract

Cities, as engines of economic growth, create entrepreneurial and employment opportunities. Given the importance of collaboration among the institutional interactions of entrepreneurial ecosystem actors for the success of employment generation programs, this study aimed to identify policies for developing a collaboration network among urban management actors in Tehran. After the literature review, documents related to urban management were examined. Through qualitative content analysis, themes related to entrepreneurship and employment were identified. Subsequently, a collaboration network matrix was formed, and the legal positions of actors were analyzed according to degree-centrality, betweenness-centrality, geodesic-distance, cut-off points, and K-core using social network analysis. There was a lack of integration and an unbalanced distribution of legal power among urban management actors in the entrepreneurial ecosystem of Tehran. In this context, policies for developing legal collaboration among actors were proposed, including redesigning and activating the policy council, forming the coordination council for entrepreneurship development in Tehran, expanding cooperation between government actors, clarifying and defining the scope of duties for non-governmental organizations, and strengthening the role of the private sector in the decision-making process. Additionally, it is suggested to develop a collaboration network to integrate science and technology policies with investment and entrepreneurship opportunities, organize the spatial distribution of technology parks and growth centers within urban areas, formulate flexible and incentivizing laws and regulations, expand investment tools, attract public participation, invest in smart infrastructure and business platforms, promote neighborhood-based entrepreneurship, establish accelerator centers for the development of micro and home-based businesses, and support an entrepreneurial culture in civic education.

### Keywords

Business development  
Entrepreneurial ecosystem  
Social network analysis  
Urban economy  
Urban management

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## 1. Introduction

Cities are engines of economic growth that generate entrepreneurial and employment opportunities by fostering diverse levels of innovation (Mitra et al., 2023). Over the past decade, interdisciplinary studies exploring the intersection of entrepreneurial ecosystems and urban development have gained traction among policymakers and researchers (Qian et al., 2024). The entrepreneurial ecosystem is a multidimensional concept that encompasses a set of institutional, cultural, economic, and social factors, the interaction of which underpins the formation and growth of innovative businesses (Correia et al., 2024). It is defined as a dynamic and multi-layered system in which various actors—entrepreneurs, investors, universities, government, and society—interact (Thai et al., 2023). The entrepreneurial ecosystem approach is regarded as a powerful analytical tool for defining competitive strategies for urban economies and territorial development through job creation and sustainable wealth (Santos, 2022). One of the most well-known theoretical frameworks of the entrepreneurial ecosystem approach is the Eisenberg model (2010), which emphasizes the interactions and interrelationships among the dimensions of the entrepreneurial ecosystem in six primary areas: 1) Politics (governance and leadership), 2) Market (customers and entrepreneurial networks), 3) Investment and financing, 4) Infrastructure support, 5) Human capital, and 6) Cultural support. This model highlights the interdependence of the actors' performance in creating balance and equilibrium within the entrepreneurial ecosystem (Penco et al., 2021; Isenberg, 2010). In the entrepreneurial ecosystem, institutions are created based on the needs of societies and mature through interaction and collaboration with one another. Governments have the responsibility to facilitate and streamline institutional interactions as well as the flow of knowledge and information within the entrepreneurship ecosystem and business development. This emphasizes the necessity for policymakers to shift their perspective from focusing solely on policies aimed at encouraging the entry of businesses to implementing supportive policies throughout the entire business lifecycle. In addition to traditional forms of government support for businesses (such as tax incentives and grants), relational forms of support—such as networking, developing connections among actors, aligning institutional priorities, and strengthening interactions—are increasingly

recognized as essential for improving the efficiency and effectiveness of the entrepreneurial ecosystem's development. Overall, more than seventy actors in the country's entrepreneurial ecosystem interact in relation to planning entrepreneurial projects and job creation (Ministry of Cooperatives, Labor and Social Welfare, 2021). Successful implementation of entrepreneurial development programs requires targeted interactions among institutional sectors and the integration and coordination of efforts to leverage potential capacities.

In recent years, extensive support programs have been implemented to develop entrepreneurship in the country. According to the Global Entrepreneurship Index, Iran has shown great promise in supporting knowledge-based companies and commercializing innovations over the past three years (UNDP, 2022). However, efforts to increase entrepreneurial activities and develop small and medium-sized enterprises (SMEs) have encountered challenges, and Iran's entrepreneurial ecosystem faces asymmetric growth and significant bottlenecks (National Entrepreneurship Development Strategy Document, 2021). Among the cities in the country, Tehran stands out due to its population concentration, political centrality, presence of top universities, and access to specialized human resources. It has a very high level of entrepreneurial attractiveness, to the extent that 50% of knowledge-based businesses (including innovative firms and startups) in Iran are located in Tehran (Vice Presidency for Science and Technology and Knowledge-Based Economy, 2025).

Policymakers and planners of urban management recognize their legal responsibilities for economic development and job creation, and the development of entrepreneurship has consistently been the subject of urban management programs. Specifically, the Law on the Development, Organization, and Promotion of Entrepreneurship in Tehran (Islamic Council of Tehran, 2009) was passed. The Fourth Plan for the Development and Progress of Tehran (2012) has also emphasized the development and support of entrepreneurship, home-based job opportunities, and creative industries, utilizing available resources in collaboration with various institutions. However, the analysis of network relationships and the coordination of institutional interactions to leverage the potential capacities of the entrepreneurial ecosystem still presents complex dimensions that have received less attention. The theoretical dimensions of the entrepreneurial ecosystem indicate that the subject of entrepreneurship

is a complex system that needs to be characterized by a multi-level network of relationships. The subject must be examined holistically and systematically in scientific analyses (Thai et al., 2023, and Fernandez and Ferreira, 2022). This study employed a social network analysis approach, which serves as a systemic method for evaluating complex communication networks and is a tool for analyzing and facilitating future collaboration among system actors. This study also reviewed documents and higher-level laws pertaining to Tehran's urban management, while conducting a literature review and examining the dimensions of the entrepreneurial ecosystems of selected cities worldwide. It identified the legal framework for collaboration among urban management institutions within Tehran's entrepreneurial ecosystem, in accordance with the six thematic areas of Eisenberg's entrepreneurial ecosystem. The collaboration network between actors was analyzed using social network analysis to assess legal authority, identify opportunities for improving institutional interactions and collaboration among urban management actors in Tehran's entrepreneurial ecosystem, and provide relevant policy recommendations.

## 2. Research background and literature review

The entrepreneurial ecosystem is a multidimensional concept that encompasses a set of institutional, cultural, economic, and social factors, whose interactions underpin the formation and growth of innovative businesses (Correia et al., 2024). It is defined as a dynamic and multi-layered system in which various actors—including entrepreneurs, investors, universities, government, and society—interact (Thai et al., 2023). One of the most well-known theoretical frameworks in the field of entrepreneurial ecosystems is the Eisenberg model, which has been proposed as a landmark in the literature on entrepreneurial ecosystems. This model highlights the interactions and interrelationships among the dimensions of the entrepreneurial ecosystem across six main domains: 1) politics (governance and leadership), which includes laws, regulations, and government policies that support entrepreneurship; 2) market (customers and entrepreneurial networks), which encompasses access to domestic and international markets for innovative products and services; 3) investment and financing, which includes access to venture capital, loans, and

diverse financial resources; 4) infrastructure support, which pertains to the existence of supporting institutions such as accelerators, incubators, and consulting services; 5) human capital, which covers education, entrepreneurial skills, and talent; and 6) cultural support, which reflects a positive societal attitude toward risk-taking, failure, and innovation, as well as the interdependence of actors in creating balance and equilibrium within the entrepreneurial ecosystem (Penco et al., 2021). This model has been employed as a foundational framework in many international studies, consistently emphasizing the synergy between different dimensions based on systemic interactions. The following section examines the research background on entrepreneurial ecosystems in urban studies and the development of entrepreneurial ecosystems in selected cities worldwide.

### 2.1. Entrepreneurial ecosystem in urban planning studies

Extensive studies have identified and examined the dimensions of the entrepreneurial ecosystem and government support policies. Inacio Junior et al. (2025) analyzed the patterns and determinants of entrepreneurial ecosystems in Brazilian cities, stating that factors such as the complexity of bureaucracy, transportation infrastructure, access to financial capital, secondary education, entrepreneurial intention, supporting organizations, and innovation inputs are essential for fostering innovative entrepreneurship. Zhao et al. (2023) examined the entrepreneurial ecosystem in 34 Chinese cities, focusing on market dynamics, finance, human capital, internet access, transportation, and government involvement. They analyzed the individual and combined effects of these factors and found that no single element of the entrepreneurial ecosystem is a necessary condition for urban innovation on its own. Additionally, they emphasized that government services play a supportive role in enhancing the broader market and transportation infrastructure. Shakiba et al. (2022), in their meta-analysis of the policies governing urban entrepreneurial ecosystems, classified general approaches into several categories: modeling the urban entrepreneurial ecosystem, investment and financing, improving social interactions among ecosystem members, supporting entrepreneurial intermediaries, maintaining a sustainable commitment to entrepreneurship,

enhancing learning opportunities, ecosystem dynamics, promoting entrepreneurship, and managing the inputs and outputs of the ecosystem. Szereb et al. (2022) analyzed the role of entrepreneurial ecosystems in the development of urban areas in Budapest, Hungary. They demonstrated that risk acceptance and funding are the least influential components of the entrepreneurial ecosystem in most city regions. Msimango-Galawe et al. (2022) mapped the needs and challenges of small and medium-sized enterprises (SMEs) within the entrepreneurial ecosystem of Johannesburg, South Africa, identifying key challenges related to access to markets, equipment, and suppliers, as well as the critical needs of investors, suppliers, and entrepreneurial training (Msimango-Galawe et al., 2022). Branz and colleagues (2022) examined cases of urban development and regeneration in Copenhagen, Denmark, and Hamburg, Germany, illustrating the way the two municipal governments pursued different forms of entrepreneurial governance to achieve a similar goal. Through this comparison, they aimed to understand better the contextual nature of entrepreneurial governance and urban development processes. Loots et al. (2021) highlighted the prominent role of culture and local policies in the entrepreneurial ecosystem of cultural and creative industries in Porto, Portugal, especially when resources are limited. They argue that taking an integrated view of the dynamics within sub-ecosystems in entrepreneurship and urban affairs can enhance the understanding of productivity and causality in entrepreneurship.

Other studies have explicitly focused on the science and technology areas of the entrepreneurial ecosystem. In this context, Bertholdo and de Castro Marins (2025) developed a framework to assess the impact of urban development policies on nascent clusters within urban technology ecosystems in São Paulo, Brazil. They demonstrated that the process of cluster formation in urban development areas is influenced by infrastructure, academic proximity, and business growth. Their work emphasizes the interactions between urban policies, infrastructure development, and economic opportunities, as well as the importance of holistic strategies for enhancing employment, sustainable urban evolution, effective talent management, and real estate management. Santos (2022) analyzed the groundwork for building

entrepreneurial ecosystems in Coimbra, Portugal, focusing on the role of the university. He demonstrated the need for a fundamental shift in strategy and paradigm to activate the university's role in urban and regional development. This included acknowledging the importance of a new generation of startups, primarily emerging from academic infrastructures and university spin-offs, in fostering innovation and enhancing the entrepreneurial ecosystem of Coimbra. He highlighted how the gradually evolving business-oriented perspective of these knowledge-based startups has significant spillover effects that benefit the growth of other companies in the same area. Yang et al. (2022) examined the relationship between the development of entrepreneurial ecosystems and economic growth at the urban level from a knowledge-based perspective. Using data from 32 cities in China, they demonstrated that the development of entrepreneurial ecosystems significantly stimulates municipal economic growth through the creation and flow of knowledge (Yang et al., 2022). Roundy (2021) examined the leadership of startup communities and the development of entrepreneurial ecosystems, demonstrating that a dynamic leadership model for startups—when combined with interactions tailored to the region's strengths and weaknesses—leads to the gradual evolution of the local entrepreneurial ecosystem.

Other studies on entrepreneurial ecosystems have focused on innovation within the context of smart technologies and smart cities. Mitra et al. (2023) proposed a framework for developing startup ecosystems in smart cities in India. Dana et al. (2022) examined the impacts of urban entrepreneurship on sustainable businesses in smart cities, emphasizing the role of digital technologies in addressing the new needs of these urban areas. Penco et al. (2021) investigated the relationship between the strength of innovative entrepreneurial ecosystems and mental well-being in 43 smart cities across Europe. They underscore the necessity for governments in smart cities to support programs aimed at improving the mental well-being of citizens and promoting a conducive entrepreneurial environment. Table 1 presents themes related to the dimensions of the entrepreneurial ecosystem in urban studies, aligned with Eisenberg's (2011) entrepreneurial ecosystem model, across six main domains.

**Table 1. Themes related to dimensions of the entrepreneurial ecosystem in urban studies**

Subsystem	Themes	Relevant urban studies
Policymaking (governance and leadership)	Understanding entrepreneurial opportunities based on competitive strategies for city economic development	Santos et al. (2022), Shakiba et al. (2022), Loots et al. (2021) Bertoldo and Bertholdo and de Castro Marins (2025) Inacio Junior et al. (2025) Mitra et al. (2023) Dana et al. (2022) Bruns-Berentelg et al. (2022)
	Integrating science and technology policies with the development of high-growth industries in the city	
	Supporting knowledge-based and startup businesses by leveraging technological entrepreneurship opportunities in the city's industries	
	Facilitating technological innovation spillovers in small and medium-sized enterprises and home-based businesses	
	Leading the development of innovation and entrepreneurship through intermediaries (growth and acceleration centers, business development consulting)	
	Laws and regulations designed to enhance the business environment for the city's entrepreneurial opportunities (licenses, permits, land and building use, fees, insurance, taxes, national and international trade laws, and intellectual property rights, etc.)	
Investment and financing (public, private, and social participation)	Monitoring the development of entrepreneurship, employment, and the city's economy (dissemination of opportunities, transparency of processes, and accountability)	Zhao et al. (2023) Msimango-Galawe et al. (2022) Szerb et al. (2022) Inacio Junior et al. (2025)
	Diversity and expansion of investment and financing tools for the city's entrepreneurial development	
	Attracting capital from financial institutions and government funds for the city's entrepreneurial opportunities	
	Engaging private investors (angel investors, venture capitalists, and corporate venture capitalists) in the city's entrepreneurial ventures	
Markets (customers and entrepreneurial networks)	Securing micro-capital and public participation in city entrepreneurship development projects	Msimango-Galawe et al. (2022) Zhao et al. (2023) Bertholdo and de Castro Marins (2025) Mitra et al., (2023)
	Identifying initial customers for the city's entrepreneurial development ideas	
	Establishing communication and distribution channels for products in urban, national, and international markets	
Infrastructure support (space, facilities, transportation, and information)	Offering products in city stores, setting up bazaars, and providing business products and services	Bertholdo and de Castro Marins (2025) Inacio Junior et al. (2025) Zhao et al. (2023) Penco et al. (2021)
	Developing workspaces in the city and locating factories, workshops, and industrial-commercial clusters	
	Providing the necessary space for technology corridors, science and technology parks, and urban growth and innovation centers	
	Ensuring access to energy, water, and sewage facilities for the city's office and commercial buildings	
Human capital (labor force and education)	Improving urban transportation and traffic for better business and market accessibility	Zhao et al. (2023) Msimango-Galawe et al. (2022) Inacio et al. (2025) Bertholdo and de Castro Marins (2025)
	Enhancing telecommunications, internet access, intelligence services, and e-business facilities	
	Planning workforce education in alignment with entrepreneurial opportunities (secondary and higher education)	
	Ensuring access to business start-up skills through university, technical, vocational education, and training programs	

## 2.2. Entrepreneurial ecosystem in selected world-wide cities

By reviewing the guiding documents for urban planning and the municipal websites, we examined the structure of urban management and the areas of innovation. Additionally, we considered reports published by local governments in San Francisco, Toronto, Tokyo, Sydney,

Muscat, and Istanbul. The initiatives undertaken by urban management to support the entrepreneurial ecosystem, as well as the coordination and integration of entrepreneurship, innovation, and employment models at the urban level, were also analyzed (Table 2).

**Table 2. Characteristics and requirements of the entrepreneurial ecosystem in selected cities**

City	Institutional structure	Innovation and entrepreneurship district	Business focus	Entrepreneurship fields	Urban management initiative	Micro-business connection initiative
San Francisco (Kushida, 2024)	Integrated urban management: mayor, city council, public service departments, and city court	Integration in the innovation area of the city and the concentration of academic, industrial, and innovational centers in Silicon Valley	-start-ups -large technology companies -international business centers -research centers	-semiconductor industry, -personal computers -digital technologies -social media -internet of things -artificial intelligence	-financial facilities and the issuance of urban entrepreneurship bonds and bank loan funds -talent development programs and scholarships for outstanding graduates, along with city visas for international entrepreneurs -flexible regulations, permits, and tax exemptions -free access to data and patterns of citizen consumption	-require technology companies to invest in local micro-businesses -technology accelerators with a social mission: providing digital marketing and website design training, among other support, to small and home-based businesses
Toronto (City of Toronto, 2021)	Integrated urban management: mayor, city council, city manager	Two groups: academic and non-academic: - academic hubs that are led as a regional umbrella structure - the distribution of seven non-academic creative industry hubs in proportion to the city's population and economy	-startups -large technology companies -research centers	- digital media -health; -legal; --education; Construction; -retail -advanced manufacturing - clean food technology	- dissemination of information on investment and entrepreneurship opportunities in the city -establishing an integrated smart service center, including licensing, market analysis, and assistance in finding business partners - prioritizing investment in women-owned businesses and indigenous enterprises - creating an urban test space for trialing products and services	-neighborhood-based specialized growth centers with free facilitation services and affordable co-working space -free skill development courses -commitment of large companies to purchase from local small businesses
Sydney (City of Sydney, 2025)	Integrated urban management: mayor, city council, and 32 local councils	An emerging technology hub with six innovation districts and a startup hub in the city center	-start-ups -small and medium-sized businesses	- health - aerospace - education - regional development: tourism, mining, agriculture and food, and waste - financial technology	- development of digital and smart infrastructures to enhance businesses' access to urban data -creating co-working spaces - recognizing small and innovative businesses - Small and medium-sized enterprises are also eligible for entrepreneurial support	- Each neighborhood has a specialized hub in the field of food and handicrafts - a smart logistics network coordinating between producers and local stores - transforming public spaces into temporary markets

City	Institutional structure	Innovation and entrepreneurship district	Business focus	Entrepreneurship fields	Urban management initiative	Micro-business connection initiative
Tokyo (Tokyo Metropolitan Government, 2023)	Two-echelon urban management: -city government, including the governor, Tokyo metropolitan assembly, and public service departments -23 municipalities and local councils	Creating a regional consortium outside the city - creating six innovation hubs in special zones for international competition in the city center	-start-ups -large technology companies -international and multinational business centers	- financial technology -digital technology, -medical, -electronics, -aerospace and aviation, -content production	-smart urban growth centers offering registration and free multilingual legal and tax advice -a smart platform for finding teammates, investors, and customers -free training and advice by retirees from large companies -holding technology transfer events in traditional industries -a dedicated city payment system (Suica)	- specialized acceleration centers for small and home-based businesses -local business investment funds -shared data platforms (smart distribution network, and sales markets)
Muscat (Oman, 2025)	Central government: governor, municipality, city council, and provincial council	Integration in the city's innovation area is concentrated in one location in Muscat's innovation park, adjacent to the industrial and university districts	-large international technology companies -start-ups -research centers	-computer science -energy -environment -information technology -food science -health and pharmacy	- integrated business service offices - Collaboration with universities to encourage students to start businesses - financial facilities, tax exemptions, and discounts on commercial space rentals for startups	-home-based business service centers -launching digital platforms for sales, logistics services, and delivery -financial support for women
Istanbul (Istanbul, 2025)	Complex and multi-layered structure: municipality, 39 local municipalities, and the governor's office	Creating an innovation corridor in the city and focusing innovation and technology centers in technology parks, along with the distributed hubs of entrepreneurship in the city	-knowledge-based companies -start-ups	- fashion and clothing - cinema and culture - tourism - handicrafts - e-commerce	-development of smart infrastructure and access to urban data -introducing entrepreneurial opportunities - supporting entrepreneurial events -bilingual growth and acceleration centers with services from international mentors	-neighborhood-based growth centers -smart platforms (distribution services, and shared warehousing) -interest-free loans for women's home-based businesses

Reviewing previous studies reveals that, despite the growing research into the dimensions of the entrepreneurial ecosystem and urban entrepreneurship development policies, analyses of institutional and regulatory interactions aimed at leveraging the institutional capacities of the entrepreneurial ecosystem from systemic approaches have received less attention. Furthermore, the Eisenberg entrepreneurial ecosystem model framework has yet to be considered in the systemic analysis of urban policies. Additionally, the interactions of urban management institutions with an entrepreneurial ecosystem approach in Tehran have not been examined using social network analysis, highlighting the innovative aspects of the current research.

### 3. Methodology

In this study, we examined the structure of the

collaboration network among actors in the entrepreneurial ecosystem, based on the laws and higher-level documents related to the development of Tehran, using a social network analysis approach. This qualitative-quantitative research aimed to identify and analyze the collaboration network of urban management actors within Tehran's entrepreneurial ecosystem. It is categorized as applied and developmental research in terms of its purpose, and as descriptive-analytical in terms of its nature.

The statistical population consisted of all urban management actors in Tehran identified as key entities in the higher-level documents related to entrepreneurship and employment development. This includes government and public organizations, councils, affiliated companies, and other institutions involved in urban policy-making. Given the nature of the research and the focus on collaboration network analysis, the research sample was selected

purposefully. Therefore, only actors who held a legal role and had a specific position in the entrepreneurship and employment policy-making process outlined in the higher-level documents were included in the network matrix.

Data were collected through qualitative content analysis of the higher-level urban management documents in Tehran. Themes related to entrepreneurship and employment were extracted and organized into a collaboration network matrix. A document review checklist, which served as the primary tool for data collection, was reviewed and approved by experts in the fields of urban management and entrepreneurship.

Several complementary measures were implemented to enhance the credibility and validity of the data. The themes extracted from the higher-level urban management documents in Tehran were initially reviewed and approved by experts in entrepreneurship and urban management to ensure content validity. Additionally, coding was conducted simultaneously by two independent researchers, and the degree of agreement between them was assessed using the Kappa coefficient, demonstrating the reliability of the data collection tool. Furthermore, the document review checklist was designed based on established theoretical frameworks and was finalized after incorporating the suggested amendments.

Data analysis was conducted using social network analysis, a systematic approach to assessing complex communication networks that facilitates future collaborations among actors across institutional boundaries (Corlew, 2015). Network analysis is a method for studying social structures using graph theory. The most important concepts in network theory include:

**Network:** A collection of at least three nodes and some edges that indicate the presence or absence of connections between the nodes. These nodes can represent individuals, groups, institutions, or organizations.

**Centrality:** This term has a broad meaning and is used to identify and determine the most critical actors or connections within a network. There are different types of centrality, with the most significant being

degree centrality and betweenness centrality.

**Degree centrality:** This is one of the most important and practical forms of centrality. The degree centrality of a node is determined solely by counting the number of its neighbors. The higher the degree of a node, the more access it has to greater and more central resources.

**Betweenness centrality:** This is calculated based on the position of actors in the network and their location in the shortest paths between pairs of actors. Betweenness centrality can be classified into two types: point-based and edge-based. The difference lies in whether a node or an edge is considered intermediary. A node has the highest betweenness centrality if it lies between many other pairs of nodes and serves as a communication pathway for them (Hanneman & Riddle, 2014).

The collaboration network of urban management actors was created and analyzed using NetDraw and UCINET, focusing on indices such as degree centrality, betweenness centrality, cutoff points, geodesic distance, and central nodes.

#### 4. Results

According to the research methodology, themes related to entrepreneurship and employment were identified from high-level documents, including the master plan of Tehran, the Fourth Plan for the Development and Progress of Tehran, and the development, organization, and promotion of entrepreneurship in Tehran. Based on the extracted themes, the involved institutions were considered system actors, and each legal theme was classified according to the six dimensions of the entrepreneurial ecosystem: policy, investment, market, human capital, infrastructure support, and culture. Table 3 presents the legal themes related to stakeholder participation in the entrepreneurial ecosystem. A total of 106 legal themes were identified in the urban management planning documents. Figure 1 illustrates the distribution of these legal themes in the urban management collaboration documents within the entrepreneurial ecosystem of Tehran.

**Table 3. Legal themes and active institution(s) of the entrepreneurial ecosystem in Tehran**

Strategic-Structural Plan for the Development and Construction of Tehran (Tehran Master Plan)			
Entrepreneurial ecosystem dimensions	Responsible and collaborative actors	Legal theme	Article
Polycymaking	Municipality/trade unions	Supervision of the scope of duties and powers of trade unions	8-2
Polycymaking	Municipality / executive authorities	Preparation of spatial information maps of infrastructure facilities	8-2
Infrastructure	Municipality / executive authorities	Infrastructure services and provision for facilities	8-2
Infrastructure	Municipality / relevant authorities/trade unions	Identification of suitable locations for permitted urban functions	9-1
Tehran urban development programs, plans, and thematic studies			
Infrastructure	Ministry of Education/ Article 5 Commission	Organization and development of educational buildings	1-1
Infrastructure	Ministry of Science and Research/ Supreme Council of Architecture and Urban Planning	Creation and organization of university campuses and technology parks	2-1
Infrastructure	Municipality/Article 5 Commission	Organization and development of public and administrative centers and buildings	4-4
Infrastructure	Relevant authorities/Article 5 Commission	Comprehensive planning of work campuses and activities for government organizations	4-5
Infrastructure	Relevant authorities/Article 5 Commission	Organization of work and activity centers	7-1
Markets	Municipality/Article 5 Commission	Establishment and organization of wholesale centers for food distribution	7-2
Infrastructure	Municipality/Article 5 Commission	Organization and establishment of jobs and transfer of diverse urban employment opportunities	7-3
Infrastructure	Ministry of Industry/ Supreme Council of Architecture and Urban Planning	Organization and establishment of industries and transfer of diverse urban industries	7-4
Markets	Ministry of Commerce/ Supreme Council of Architecture and Urban Planning	Locating, organizing, and equipping exhibition centers	7-5
Cultural support	Municipality/Ministry of Culture and Islamic Guidance	Promotion of the culture and knowledge of the city and its citizens	16-1
Infrastructure	Municipality/City Council	Organization of its services to facilitate service delivery to citizens	16-6
Polycymaking	Municipality/Ministry of Economy and Finance	Organization of commercial usage fees	17-6
Tehran's local urban development plans and programs			
Cultural support	Municipality/Supreme Council of Architecture and urban planning/relevant authorities	Establishment of the Tehran media-art center	2-2
Cultural support	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Establishment of the Tehran social-cultural center	2-3
Infrastructure	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Organization of a center for modern activities in Tehran	2-4
Infrastructure	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Organization of a center for commercial-historical activities in Tehran bazaar	2-5
Infrastructure	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Establishment of a global economic center	2-6
Infrastructure	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Organization of the Milad Tower Global Communications Center	2-8

Tehran's local urban development plans and programs			
Infrastructure	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Organization of commercial-service centers	2-9
Infrastructure	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Organization of urban service centers	2-11
Infrastructure	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Organization of valuable historical areas	3
Infrastructure	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Organization of valuable natural and environmental zones	4
Infrastructure	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Organization of the service-tourism zone	5-1
Infrastructure	Municipality/Supreme Council of Architecture and Urban Planning/relevant authorities	Organization and refinement of the modern/ industrial zone	5-2
Infrastructure	Supreme Council of Architecture and Urban Planning/relevant authorities	Organization of the cultural-research zone of Tehran	7-1
Infrastructure	Municipality/ relevant authorities/Article 5 Commission	Creation and organization of metro stations	9-2
Infrastructure	Municipality/ relevant authorities/Article 5 Commission	Organization of urban and intercity bus terminals	9-4
Infrastructure	Municipality/ relevant authorities/Article 5 Commission	Creation and organization of terminals and transportation support complexes	9-5
The Fourth Plan for the Development and Progress of Tehran is based on the realization of urban justice			
Entrepreneurial ecosystem dimensions	Responsible and collaborative actors	Legal theme	Article
Markets	Tehran Municipality/Private Sector	Establishing legal requirements for holding all large-scale exhibitions at the Aftab International Exhibition Site	27
Markets	Municipality/Private Sector	Implementing a cargo and goods distribution service system	32
Markets	Municipality/Private Sector	Establishing seasonal markets	103
Markets	Tehran Municipality	Creating self-employment markets and exhibitions for women heads of households	103
Human capital	Tehran Municipality	Training and empowering seasonal workers and mobile businesses	103
Human capital	Tehran Municipality/ Welfare/Non-Governmental Organizations/Anti-Drug Headquarters	Promoting business and entrepreneurship in underprivileged and vulnerable neighborhoods	103
Human capital	Municipality/ Welfare/Judiciary/Anti-Drug/ Ministry Of Interior/Ministry Of Health	Encouraging entrepreneurship and mobilizing socially disadvantaged individuals with an emphasis on skills training for those recovering from addiction	103
Cultural support	Tehran Municipality	Hosting the national award festival for top urban businesses	103
Human capital	Municipality/Technical And Professional Organization	Providing skill training, consulting, and market development for small businesses	103
Cultural support	Tehran Municipality	Producing specialized entrepreneurship content and conducting information campaigns	103
Human capital	Tehran Municipality	Training business facilitators and consultants	103
Human capital	Tehran Municipality/Ministry of Cooperatives, Labor, and Welfare/welfare/non-governmental organizations	Strengthening and developing home-based businesses	103

The Fourth Plan for the Development and Progress of Tehran is based on the realization of urban justice			
Entrepreneurial ecosystem dimensions	Responsible and collaborative actors	Legal theme	Article
Polymaking	Tehran Municipality/Private Sector	Providing offline and online services to private sector firms	105
Infrastructure	Tehran Municipality/Private Sector	Developing sustainable digital communication infrastructures	106
Infrastructure	Tehran Municipality	Creating an electronic business interoperability document	109
Polymaking	Tehran Municipality	Establishing a comprehensive urban statistics system	110
Polymaking	Tehran Municipality	Publishing information and data on the transparency system	111
Markets/ infrastructure	Tehran Municipality	Developing virtual sales platforms for citizen stores and fruit and vegetable markets	122
Polymaking	Tehran Municipality	Developing and implementing the urban innovation and technology roadmap	125
Polymaking	Tehran Municipality	Initiating purchase contracts for services and products from knowledge-based companies	125
Financial investment	Tehran Municipality	Rate of venture capital	125
Polymaking	Tehran Municipality	Enhancing technological understanding with sister cities	125
Polymaking	Tehran Municipality	Establishing urban innovation parks, centers, and districts	125
Polymaking	Tehran Municipality	Supporting direct and indirect participation in the innovation ecosystem	125
Decree on the development, organization, and promotion of entrepreneurship in Tehran			
Entrepreneurial ecosystem dimensions	Responsible and collaborative actors	Legal theme	Article
Polymaking	Municipality	Planning and creating support for entrepreneurship centers and urban business clusters	Single
Polymaking	Municipality/Entrepreneurs/Startups	Attracting and supporting entrepreneurs and start-ups	Single
Polymaking/human capital	Municipality	Establishing skill training centers and empowering vulnerable groups	Single
Polymaking/ infrastructure	Municipality	Creating and supporting technology parks	Single
Human capital	Tehran Municipality / Relevant Authorities	Preparing targeted programs to promote and enhance entrepreneurship training	Single
Market/cultural support	Municipality	Utilizing urban advertising resources for information dissemination and promotion	Single
Polymaking/human capital	Municipality/Universities And Research Centers/Cooperatives	Supporting the establishment and expansion of universities and research centers, forming cooperatives, and providing consulting services	Single
Polymaking	Municipality/University / Knowledge-Based Company/Startups	Encouraging the formation of start-ups and knowledge-based companies	Single
Financial investment	Municipality/Entrepreneurs	Allocating credit and financial resources to urban entrepreneurs	Single

Decree on the development, organization, and promotion of entrepreneurship in Tehran			
Entrepreneurial ecosystem dimensions	Responsible and collaborative actors	Legal theme	Article
Infrastructure	Municipality/Entrepreneurs	Facilitating and supporting the activities of the network of interactions among entrepreneurs	Single
Policymaking	Municipality/Governmental Centers	Encouraging national and provincial institutions that support entrepreneurship	Single
Human capital	Municipality / Relevant Authorities	Organizing and structuring independent workers	Single
Policymaking	Municipality	Coordinating with the entrepreneurship headquarters to ensure the effectiveness of activities	Single
Regulations for the development, organization, and promotion of entrepreneurship in Tehran			
Market	Municipality/City Council	Cooperation in organizing exhibitions and temporary self-employment bazaars	5-1
Market	Municipality	Optimal and effective use of spaces and environmental advertising throughout the city	5-1
Policymaking	Municipality/Knowledge-Based Companies/Entrepreneurs	Leveraging the talents and capabilities of entrepreneurs and knowledge-based companies in urban services	5-1
Market	Tehran Municipality/Business Owners/Entrepreneurs	Creating opportunities for the presentation of products by business owners and entrepreneurs in citizen stores and fruit and vegetable markets	5-1
Policymaking	Municipality	Developing a platform to foster new job and trade opportunities in the city	5-1
Policymaking	Municipality/Knowledge-Based Companies/Entrepreneurs	Utilizing the talents and capabilities of entrepreneurs and knowledge-based companies in technical and civil engineering activities	5-1
Policymaking	Municipality/Knowledge-Based Companies/Entrepreneurs	Harnessing the skills and expertise of entrepreneurs and knowledge-based companies in the specialized field of transportation	5-1
Policymaking	Municipality/Knowledge-Based Companies/Entrepreneurs	Employing the talents and capabilities of entrepreneurs and knowledge-based companies in urban planning and architecture	5-1
Financial investment	Municipality/Financial And Credit Institutions	Supporting the establishment and launch of microcredit funds at the regional and local levels and introducing them to financial and credit institutions	5-1
Policymaking	Tehran Municipality/ Relevant Authorities	Ensuring the precise implementation of resolutions and fostering entrepreneurship.	5-1
Policymaking	Tehran Municipality/City Council	Addressing legal deficiencies and gaps to improve the business environment	5-1
Cultural support	Tehran Municipality	Providing access to information services	5-1
Cultural support/ infrastructure	Tehran Municipality	Utilizing the resources and facilities of cultural centers and houses of culture to promote a work culture and support entrepreneurs	5-1
Cultural support	Islamic Republic Of Iran Broadcasting	Collaborating on cultural advertising initiatives in the field of entrepreneurship	5-2
Policymaking	Ministry Of Labor/Cooperatives/Small And Home-Based Businesses	Offering legal and financial support, facilitating cooperative registration, and aiding small and home businesses	5-2

Regulations for the development, organization, and promotion of entrepreneurship in Tehran			
Human capital	Ministry Of Labor/Entrepreneurs	Providing educational standards and services to entrepreneurs	5-2
Human capital	Technical And Professional Organizations/Entrepreneurs	Cooperating in the development of technical and vocational training for entrepreneurs	5-2
Financial investment	Omid Entrepreneurship Fund/Small Business	Allocating credit for small and medium-sized enterprises	5-2
Financial investment	Omid Entrepreneurship Fund	Offering financial support for microcredit funds in neighborhoods	5-2
Polycymaking	Educational Centers And Universities	Supervising student theses on urban entrepreneurship topics	5-2
Human capital	Educational Centers And Universities	Collaborating in organizing training courses	5-2
Polycymaking	Educational Centers And Universities	Conducting research, investigations, and studies in urban entrepreneurship	5-2
Polycymaking	Deputy Minister Of Science And Technology/ Knowledge-Based	Supporting knowledge-based companies active in urban management	5-2
Human capital	Deputy Minister Of Science And Technology	Providing specialized training services to top talent	5-2
Financial investment	Deputy Minister Of Science And Technology	Offering financial support for projects in urban management	5-2
Infrastructure	Ministry Of Science, Research, And Technology	Cooperating in the design of science and technology parks and urban growth centers	5-2
Polycymaking	Chamber Of Commerce/Startups/Entrepreneurs	Providing legal and executive support for entrepreneurs and start-ups	5-2
Polycymaking	Chamber Of Commerce/Startups/Entrepreneurs	Issuing licenses and related services for entrepreneurs and start-ups	5-2
Polycymaking	Judiciary/Knowledge-Based Companies	Enhancing the business environment and supporting knowledge-based companies	5-2

### The legal theme of collaboration between urban management actors in the development of entrepreneurship in Tehran

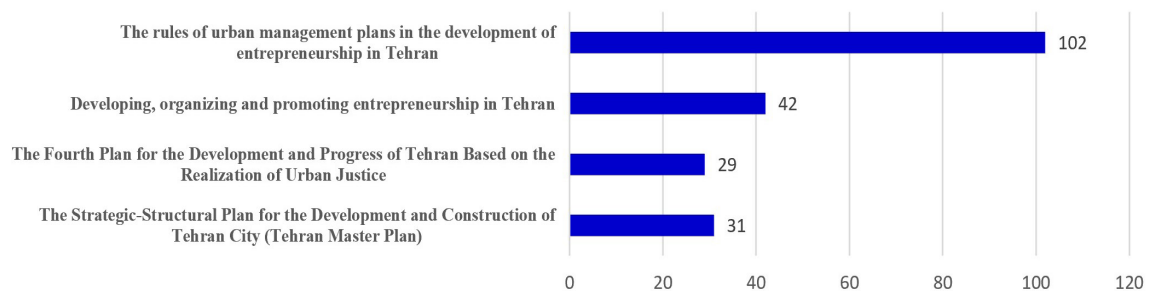


Figure 1. Distribution of the legal themes of collaboration among urban management actors in the development of entrepreneurship in Tehran.

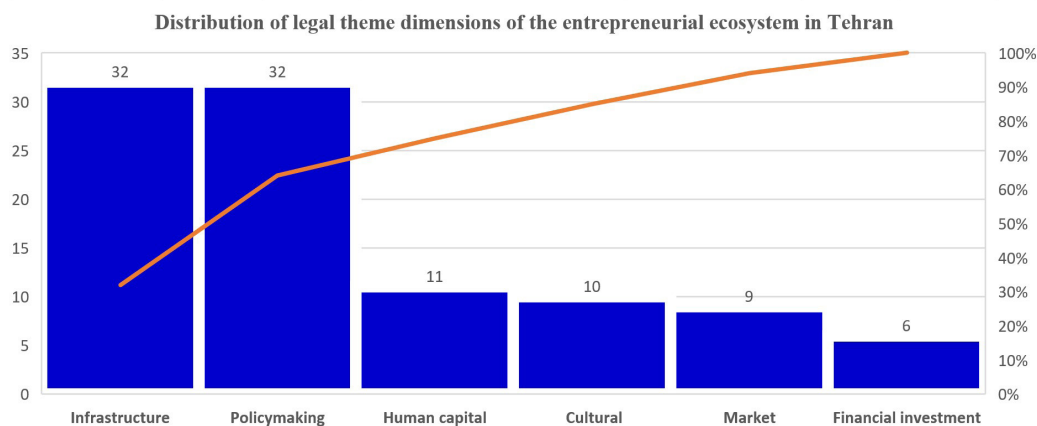


Figure 2. Distribution of collaboration themes among urban management actors in the entrepreneurial ecosystem dimensions in Tehran.

According to Figure 2, the legal themes of Tehran’s urban management programs primarily focus on infrastructure support (32 themes) and policymaking (32 themes). In contrast, human capital (11 themes), cultural support (10 themes), market (9 themes), and investment (6 themes) receive comparatively less

attention. To analyze the collaboration network of urban management stakeholders, 34 collaborating actors in Tehran’s entrepreneurial ecosystem were identified, along with the legal themes relevant to each actor. Table 4 presents the identified actors.

Table 4. Urban management actors in the entrepreneurial ecosystem of Tehran

Responsible actor and urban management collaborator	Symbol	Responsible actor and urban management collaborator	Symbol
Tehran knowledge-based companies	ORG 01	Tehran Province Cooperatives, Labor, and Welfare Directorate	ORG 18
Tehran’s small and home-based businesses	ORG 02	Presidential Deputy for Science and Technology	ORG 19
Tehran entrepreneurs	ORG 03	Tehran Municipality	ORG 20
Tehran Chamber of Commerce	ORG 04	Tehran City Council	ORG 21
Tehran Chamber of Guilds	ORG 05	Ministry of Science, Research, And Technology*	ORG 22
Ministry of Energy*	ORG 06	Ministry of Industry, Mines, and Trade*	ORG 23
Private sector	ORG 07	Ministry of Education *	ORG 24
Omid Entrepreneurship Fund	ORG 08	Ministry of Interior*	ORG 25
Tehran cultural heritage, tourism, and handicrafts	ORG 09	Ministry of Roads and Urban Development*	ORG 26
Tehran Planning and Budget Organization	ORG 10	Ministry of Culture and Islamic Guidance*	ORG 27
Tehran Welfare Organization	ORG 11	Ministry of Health, Treatment, and Medical Education*	ORG 28
Tehran Environmental Protection Organization	ORG 12	Ministry of Agricultural Jihad*	ORG 29
Non-governmental organizations	ORG 13	Ministry of Economy and Finance*	ORG 30
Banks/financial and credit institutions	ORG 14	Ministry of Communications and Information Technology*	ORG 31
Tehran Technical and Vocational Organization	ORG 15	Judiciary	ORG 32
Cooperatives	ORG 16	Islamic Republic of Iran Broadcasting	ORG 33
Related agencies	ORG 17	Tehran startups	ORG 34

\*The names of the actors correspond with the documents. Representatives from the ministries of the executive apparatus at the city level in Tehran are of interest to urban management planners.

#### 4.1. Analysis of the collaboration network of urban management actors in the entrepreneurial ecosystem of Tehran

Based on the identified legal themes, a collaboration matrix for responsible and cooperative urban management actors was developed. Actors were represented as both rows and columns in the matrix, and the number of collaborations among the actors served as the values related to the cells in the actor-actor network matrix. Using UCINET software, degree centrality, betweenness centrality, geodesic distance, cutoff points, and central nodes of the network were

calculated and analyzed. Consequently, the relevant networks were illustrated using NetDraw software. Figure 3 displays the collaboration network of urban management actors in Tehran's entrepreneurial ecosystem. An edge between two nodes indicates a legal collaboration relationship between two urban management actors. The urban management collaboration network is fragmented and inconsistent, indicating that collaboration with many key actors in the entrepreneurial ecosystem has not yet been established. The results of the social network analysis indices are presented below.

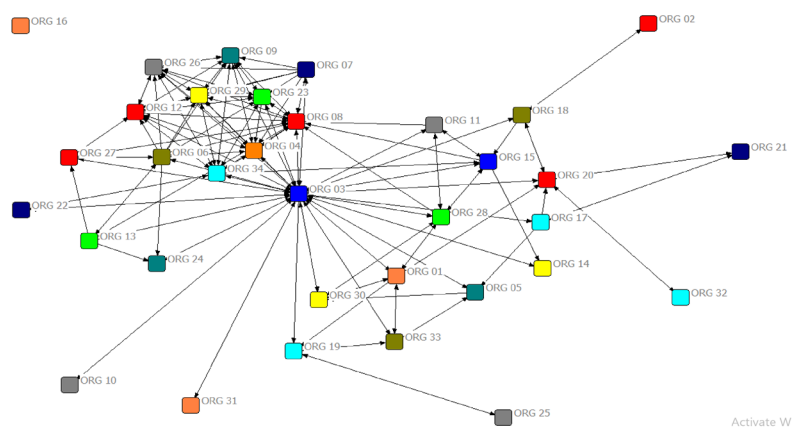


Figure 3. Collaboration network of urban management actors in the entrepreneurial ecosystem of Tehran

**Degree centrality:** The collaboration network is presented according to the degree centrality of each actor in the network (Table 5 and Figure 4). The larger the size of an actor node, the greater the actor's degree centrality is. An actor with higher degree centrality possesses more legal authority to collaborate within the entrepreneurial ecosystem. The results indicate that, in this network, the Municipality of Tehran (ORG 03) has the highest legal collaboration power in the city's entrepreneurial ecosystem. Following closely are the Tehran City Council (ORG 04), the Ministry of Interior (ORG 08), and the Ministry of Roads and Urban Development (ORG 09), as well as other actors from the Supreme Council of Architecture

and Urbanism of Tehran and the Article 5 Commission, all of which also hold significant legal power. There is a considerable gap between these actors and others in terms of legal collaboration. Among the remaining actors, significant distances exist regarding legal collaborations. Contrary to expectations, key actors, such as the Vice Presidency for Science and Technology (ORG 02), the Tehran Chamber of Commerce (ORG 21), the Technical and Vocational Organization of Tehran (ORG 32), the Omid Entrepreneurship Fund (ORG 25), and banks and financial institutions (ORG 31) display the weakest legal collaboration power with other urban management actors.

Table 5. Normalized degree centrality and betweenness centrality of urban management actors in the entrepreneurial ecosystem of Tehran

Symbol	Betweenness centrality	Normalized degree centrality	Symbol	Betweenness centrality	Normalized degree centrality
ORG 01	12.167	0.182	ORG 18	63.333	0.394
ORG 02	0	0.03	ORG 19	62	0.182
ORG 03	776.369	7.786	ORG 20	95.833	0.636

Symbol	Betweenness centrality	Normalized degree centrality	Symbol	Betweenness centrality	Normalized degree centrality
ORG 04	0.393	6.242	ORG 21	1	0.121
ORG 05	1.833	0.121	ORG 22	0	0.091
ORG 06	4.167	0.152	ORG 23	0.393	5.364
ORG 07	0	0.30	ORG 24	0	0.212
ORG 08	13.202	6.545	ORG 25	0	0.030
ORG 09	0.536	6.152	ORG 26	0.393	5.364
ORG 10	0	0.03	ORG 27	0.250	0.091
ORG 11	0	0.121	ORG 28	5	0.212
ORG 12	2.119	6.182	ORG 29	0.393	6.152
ORG 13	0	0.121	ORG 30	1	0.182
ORG 14	0	0.121	ORG 31	0	0.030
ORG 15	8.167	0.242	ORG 32	0	0.030
ORG 16	0	0.000	ORG 33	60.500	0.091
ORG 17	26.167	0.121	ORG 34	13.786	4.576

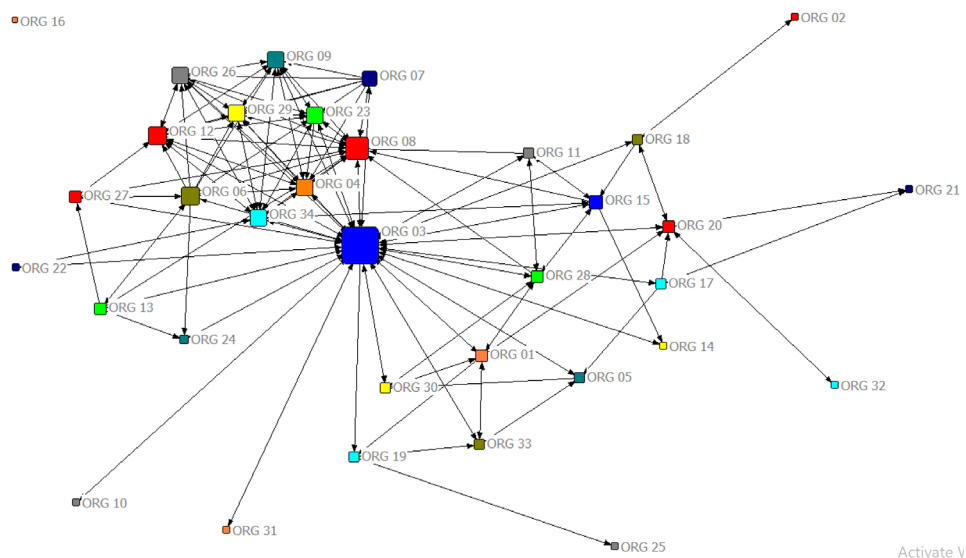


Figure 4. Collaboration network of urban management actors in the entrepreneurial ecosystem of Tehran based on degree centrality.

**Cut-off points:** Cutoff points are those points that, when removed, cause the network structure to split into two disconnected parts. The significance of these points lies in identifying the vulnerable sections of the network and the key players. Essentially, cutoff points act as communication bridges between the vulnerable segments of the network and the key players. The greater the number of these points, the more it indicates the network's susceptibility and a decrease in its integrity. Figure 5 illustrates the cutoff points in the legal collaboration network among urban

management actors involved in the entrepreneurial ecosystem of Tehran. The municipality of Tehran (ORG 03), micro and home-based businesses (ORG 19), entrepreneurs in Tehran (ORG 20), and knowledge-based companies (ORG 18) are identified as cutoff points in the urban management collaboration network. They are crucial and vulnerable for achieving entrepreneurial development goals, making it essential to strengthen legal collaboration with other actors in the network to enhance participation in ecosystem decision-making.

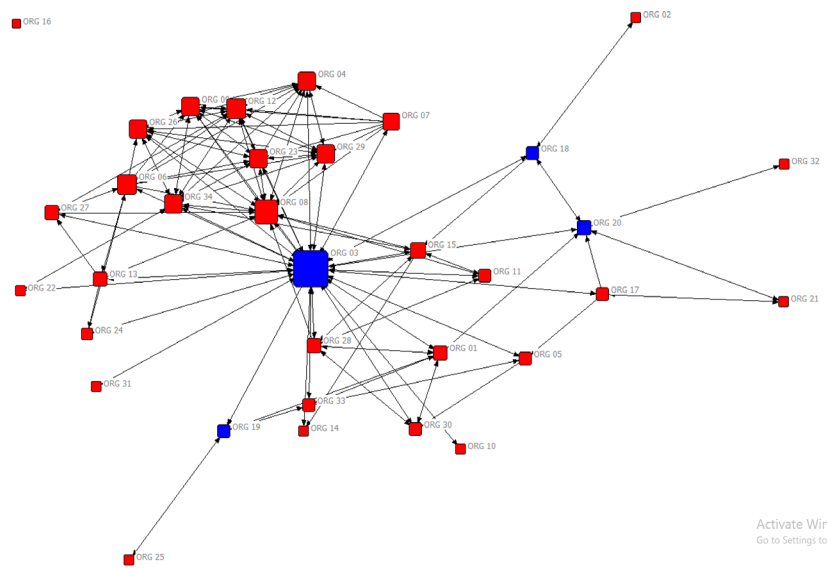


Figure 5. Cutoff points of the collaboration network of urban management actors in the entrepreneurial ecosystem of Tehran.

**Central nodes:** Central nodes were calculated, analyzed, and illustrated using the K-Core tool in the network. In general, power centers comprise a collection of actors who have much closer relationships with one another than with other actors in the network. To identify which actor belongs to which central node, actors are colored the same. Additionally, the size of each node within the central nodes is proportional to the strength of each actor in that center. There are five central nodes in the structure of the network (Figure 6). The first group consists of the central node of the Municipality (ORG 03), the Ministry of Roads and Urban Development (ORG 09), the city council (ORG 04), and other actors from the Supreme Council of Architecture and Urbanism of Tehran and

the Article 5 Commission, with the central power core being the municipality of Tehran (ORG 03) (these actors are colored blue). The second central node includes actors from the Tehran general directorate of cooperatives, labor, and social welfare (ORG 01), the Vice Presidency for Science and Technology (ORG 02), the Ministry of Science, Research, and Technology (ORG 05), entrepreneurs in Tehran (ORG 20), knowledge-based companies (ORG 18), startups (ORG 17), non-governmental organizations (ORG 30), cooperatives (ORG 33), the private sector (ORG 24), and micro and home-based businesses. Other central nodes are marked in gray, green, and light blue in the figure.

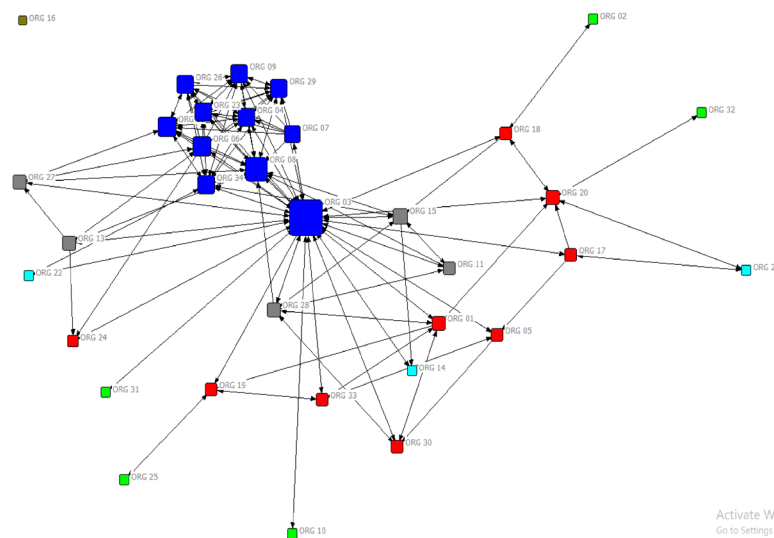


Figure 6. Central nodes of the collaboration network of urban management actors in the entrepreneurial ecosystem of Tehran

**Geodesic distance:** Geodesic distance is applied to measure the speed of collaboration and the flow of resources and information in the network, based on the average shortest distance between pairs of actors. As the average geodesic distance decreases, the speed of information circulation among entities increases, resulting in less time spent coordinating these entities and allowing stakeholders to connect more quickly. Figure 7 illustrates the network of urban management actors based on geodesic distance. The municipality of Tehran (ORG 03) is at the center of this network, with many actors located at a very short distance from it. However, actors such as the Ministry of Cooperatives, Labor, and Social welfare (ORG 01), the Vice Presidency

for Science and Technology (ORG 02), the Technical and Vocational Organization of Tehran (ORG 32), cooperatives (ORG 33), micro and home-based businesses (ORG 19), startups (ORG 17), knowledge-based companies (ORG 18), and entrepreneurs in Tehran (ORG 20) are positioned at a considerable distance from other urban management actors. Overall, due to the geodesic distances among key entrepreneurial actors, inter-institutional collaboration faces informational delays and a lack of coordination in urban management concerning innovative and technological activities related to the development and entrepreneurship of Tehran.

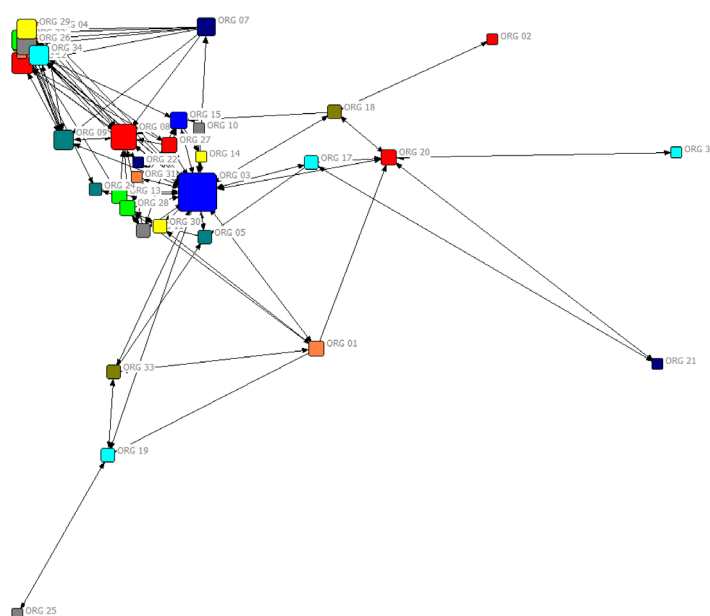


Figure 7. Collaboration network of urban management actors in the entrepreneurial ecosystem of Tehran based on geodesic distance.

## 5. Discussion

The findings revealed that urban management documents in Tehran primarily focus on policymaking and infrastructure. At the same time, other dimensions of the entrepreneurial ecosystem—such as human capital, market, investment, and cultural support—have received less attention. The analysis of these findings, in comparison with previous studies and in light of Eisenberg’s dimensions of the entrepreneurial ecosystem, is described below:

**Policymaking and governance:** The emphasis on policymaking in Tehran aligns with the findings of Shakiba et al. (2022) and Santos (2022), who identified urban policies as crucial for shaping the entrepreneurial ecosystem. However, these policies have largely remained at the level of regulations and

documentation, failing to evolve into an integrated institutional network. In contrast, Branz et al. (2022) found that in Copenhagen and Hamburg, adaptive governance has successfully fostered the creation of dynamic ecosystems.

**Infrastructure:** The extensive focus on infrastructure (32 themes) in Tehran aligns with the studies by Zhao et al. (2023) in China and Bertoldo and Marins (2025) in São Paulo, which identified transportation infrastructure, technology centers, and proximity to universities as key factors for urban innovation. However, our findings indicate that these infrastructures have not fully integrated with human capital and markets. In contrast, in Sydney and São Paulo, infrastructure has played a direct role in the formation of startup clusters and the interaction

between universities and the market.

**Human capital:** Our findings revealed that human capital has been addressed in only 11 themes and is primarily limited to the education of vulnerable populations. This contrasts with the studies by Yang et al. (2022) in China, which indicated that knowledge flow and human capital are key drivers of urban economic growth. Additionally, in Toronto, investments in the education of women and Indigenous peoples were identified as essential policies, whereas such an approach is less evident in Tehran.

**Markets and entrepreneurial networks:** The emphasis on local markets and exhibitions in Tehran aligns with the studies by Simango et al. (2022) in Johannesburg, which identified access to markets as the primary challenge. However, in cities like Istanbul and San Francisco, markets have evolved into global and digital networks. Our findings indicate that markets in Tehran mainly remain at the local level, with weak connections to international networks.

**Investment and financing:** The significant weakness in investment (6 themes) in Tehran aligns with the findings of Szerb et al. (2022) in Budapest, who identified inadequate financing as a primary barrier to development. In contrast, in San Francisco and Tokyo, venture capital and equity funds are the main drivers of innovation. This discrepancy suggests that Tehran needs to develop innovative financial instruments and attract bold investors.

**Culture and social support:** Our findings for Tehran indicate that culture is primarily expressed through festivals and urban promotions. This contrasts with the research by Lottus et al. (2021) in Porto, which identified local culture and creative industries as key drivers of the entrepreneurial ecosystem. Furthermore, in European smart cities (Penco et al., 2021), citizens' mental well-being is considered part of the entrepreneurial ecosystem, whereas such an approach is less evident in Tehran.

Overall, while there are overlaps in policy and infrastructure dimensions with international studies, there remains a significant gap in the softer aspects of the ecosystem, such as human capital, markets, investment, and culture. These differences indicate that Tehran needs to move beyond a sole focus on policy and infrastructure to align more closely with global trends. It should shift toward institutional integration, strengthen human capital, develop innovative financial tools, and foster global networking. Additionally, this research underscores the importance of network analysis in understanding the urban

entrepreneurial ecosystem. Despite numerous legal themes, a lack of practical institutional connections can impede the achievement of entrepreneurial development goals. Based on the results, a balance must be established among the various dimensions of the ecosystem in Tehran's urban management, ensuring that human capital, markets, and investment receive as much attention as policy and infrastructure. Furthermore, enhancing the roles of financial institutions, universities, and the private sector in collaborative networks can improve the efficiency and sustainability of the entrepreneurial ecosystem. The summary of the findings from the network analysis is as follows:

**Institutional centrality:** The Tehran Municipality serves as the core of network power, indicating that the structure is heavily municipality-centric, with other stakeholders positioned on the periphery.

**Key institutions:** Contrary to expectations, institutions such as the Vice Presidency for Science and Technology, the Tehran Chamber of Commerce, the Omid Entrepreneurship Fund, and banks exhibit the weakest legal collaboration power. This weakness highlights a significant gap between urban policies and the financial and scientific institutions that are recognized as the main drivers of innovation in international studies, including those in San Francisco and Toronto.

**Network vulnerability:** The Tehran Municipality, small and home-based businesses, entrepreneurs in Tehran, and knowledge-based companies have been identified as critical points in the network. The removal or weakening of these actors could fragment the network into disconnected segments and diminish the integrity of the ecosystem. This finding suggests that Tehran's entrepreneurial ecosystem is highly vulnerable and heavily reliant on a few limited actors.

**Central nodes:** The K-Core analysis revealed five central nodes within the network, with the Tehran Municipality serving as the central core. This concentration of power in one single institution contrasts with studies in Toronto and Sydney, where power is more evenly distributed among universities, the private sector, and local government, resulting in a more balanced network.

The findings indicated that, despite numerous legal themes, the lack of influential institutional connections and the concentration of power in the Municipality hinder the achievement of entrepreneurial development goals. Therefore, social network analysis—as a complementary approach—reveals the structural weaknesses of Tehran's entrepreneurial

ecosystem and underscores the need to move toward a balanced and polycentric network. Urban management in Tehran should focus on strengthening the roles of academic, financial, and private sector institutions within the collaborative network, rather than concentrating solely on the municipality. The integrity of the ecosystem can be improved by establishing legal mechanisms to enhance connections between peripheral actors (such as financial funds and universities) and the core of the network. Insights from international cities demonstrate that the distribution of institutional power and global networking can facilitate urban entrepreneurial development.

## 6. Conclusion

This research aimed to identify policies for developing a collaborative network among urban management actors in the entrepreneurial ecosystem of Tehran. To this end, an initial review of the literature on urban studies and the identification of relevant themes in the entrepreneurial ecosystem was conducted, followed by an examination of the structure and a review of supportive documents and policies in urban ecosystems of cities worldwide. Subsequently, laws and documents related to entrepreneurial development were explored in the resolutions of the Islamic Council of Tehran, along with four high-level urban management documents: the Tehran strategic-structural master plan, the Law On The Development, Organization, and Promotion of Entrepreneurship in Tehran (passed in 2009), and the Fourth Plan for the Development and Progress of Tehran. 106 themes related to entrepreneurship and employment were identified across six thematic areas based on qualitative content analysis: infrastructure (36 themes), policy (32 themes), human capital (11 themes), cultural support (10 themes), market (9 themes), and investment (6 themes), along with 34 responsible and collaborating actors. Subsequently, a collaboration network matrix was formed, and the legal positions of urban management actors within Tehran's entrepreneurial ecosystem were analyzed according to degree centrality, betweenness centrality, geodesic distance, critical points, and central nodes. In general, the lack of an integrated urban management system has hindered inter-agency collaboration for employment and entrepreneurship development. Therefore, it is essential to prioritize the pursuit of an integrated urban management plan. Accordingly, urban management laws should be revised, and the

city council should be granted the authority to oversee the implementation of these integrated urban management laws. Additionally, the urban planning system needs to be redesigned based on realistic goals and competitive development strategies for the city, along with the establishment of legal frameworks to facilitate agreements and participation among actors. Currently, the emphasis is solely on site selection, building and land use permits, and toll payments. This situation necessitates a revision of the master plan of Tehran, with a focus on policies for entrepreneurial development and employment. Furthermore, to enhance collaboration among urban management actors within Tehran's entrepreneurial ecosystem by developing institutional and legal capacities, and to balance the distribution of legal power among the involved entities, the following policy recommendations are provided:

- Redesign and activation of the Tehran Entrepreneurship Development Policy Council: The Entrepreneurship Development Policy Council should be restructured to include key actors in Tehran's entrepreneurial development, such as representatives from governmental and public entities, private sector investors, entrepreneurs, and owners of large, small, medium, and home-based businesses. It should operate through six specialized working groups focused on developing the entrepreneurial ecosystem—policy, investment, infrastructure, market, human capital, and cultural support—to actively pursue initiatives for entrepreneurship, employment, and local economic development. The performance of the council should be overseen by the Tehran City Council or an independent body, with regular performance reports published.
- Formation of the Tehran coordination headquarters for entrepreneurship development policy: It is recommended to establish a coordination headquarters for executive bodies, non-governmental organizations, and citizens, given the complexity and interconnected relationships among a wide range of actors. This headquarters can serve as an intermediary and regulatory entity, functioning according to its role and legal responsibilities within the entrepreneurial ecosystem, while taking into account the betweenness centrality of the Tehran Municipality.
- Strengthening collaboration for balanced power distribution among actors in Tehran's entrepreneurial development: Given the multi-sectoral structure,

cutoff points in the network, and concentration of central powers, it is recommended to enhance legal collaborations between the Ministry of Industry, Mine, and Trade, the Vice Presidency for Science and Technology, and the Ministry of Science, on one hand, and investors, entrepreneurs, business owners, guilds, the Chamber of Commerce, and community organizations, on the other. This should include collaboration with the municipality and the Ministry of Roads and Urban Development to achieve a balance of power among the actors in the network.

- Expanding collaboration among government actors and urban management in Tehran's entrepreneurial ecosystem: Considering the lack of cooperation between some key actors in the current structure, it is essential to formally expand the collaboration of urban management with the Iran industrial development and renovation organization, the Tehran mining and mineral industries renovation and development organization, the small industries and industrial towns organization of Iran, the tax administration, the Ministry of Industry, Mine, and Trade, the Ministry of Foreign Affairs, the Tehran stock exchange, the privatization organization, the competition council, science and technology parks, growth and innovation centers, the social security organization, the presidential vice presidency for women's affairs, the national elite foundation, the academic center for education, culture and research, the business research studies institute, and the statistics center.
- Clarifying and defining the scope of responsibilities for non-governmental organizations in Tehran's entrepreneurial ecosystem: Given that the role of community organizations is generally described in the current collaboration network, it is essential to clearly define the roles and responsibilities of each institution, organization, and non-governmental entity. This includes groups such as the Imam Khomeini Relief Foundation, the Foundation of the Underprivileged, the Foundation of Martyrs and Veterans' Affairs, the Alavi Foundation, the Barakat Foundation, jihadi groups, and benefactors in advancing the entrepreneurial development goals of Tehran.
- Strengthening the position and empowering the private sector in decision-making processes for entrepreneurship development: Given the significant role of the private sector in investment and financing, as well as in growth and innovation centers and various types of businesses, representatives from

leading entrepreneurs, large technology companies, knowledge-based and startup enterprises, small and medium-sized businesses, micro and home-based businesses, the Chamber of Guilds, the Chamber of Commerce, and employers' associations should be included in the decision-making process.

In addition to policies aimed at strengthening the collaboration network among actors in Tehran's entrepreneurial ecosystem, policy recommendations based on legal themes and comparative analysis with the entrepreneurial ecosystems of the cities under study are proposed to create opportunities for collaboration with other stakeholders, thereby enhancing the role of urban management actors in Tehran's entrepreneurial ecosystem as follows.

- Integration of science and technology policies and entrepreneurship investment opportunities in Tehran: Identifying investment and entrepreneurship opportunities in the city that align with competitive development strategies, integrating science and technology policies with the growth of high-potential industries, guiding knowledge-based and startup businesses based on technological entrepreneurship opportunities, and creating incentives for large tech companies to establish business accelerators and co-working spaces. Additionally, mechanisms for training startup businesses and supporting creative industries should be developed.
- Organizing technology parks and incubation centers in urban areas (scientific, industrial, commercial, historical, and natural): Considering the spatial distribution of 10 science and technology parks, 37 innovation and technology centers, and over 50 approved active creative and innovation houses in Tehran, as per data from the vice presidency for science, technology, and the knowledge-based economy, it is recommended to organize the allocation of spaces and establish technology corridors. Science and technology parks and hubs for growth and innovation should be distributed according to the specialized uses of urban areas (scientific, industrial, commercial, historical, and natural). In this context, the application of reserved urban lands and zoning opportunities should be taken into account for organizing urban areas.
- Drafting flexible and incentive regulations for licensing, toll payment, insurance, and taxes: initiatives are proposed to develop flexible regulations for obtaining licenses and making legal payments for businesses, allowing certain expenses related to research, development, or training for

small and medium-sized enterprises to be considered acceptable expenses for urban fees and taxes. Additionally, it is suggested to expand social security insurance coverage in the informal, micro, and home-based sectors, and to require technology companies to invest in the development of local micro-businesses, or for large companies to commit to purchasing from local micro-businesses.

- Diversification and expansion of investment tools and financing to attract public participation capital: Attention should be given to the diversification and expansion of financing tools through the issuance of urban entrepreneurship bonds, increasing collaboration with investment and financing funds, providing low-interest loans, offering credit guarantees, and establishing mechanisms for eligibility assessment and transparency in the allocation of investment and entrepreneurship opportunities in Tehran.
- Investment in smart infrastructure and business platforms in Tehran: it is recommended to increase investment in digital platforms related to communication and the supply chain of products and services (including raw material sourcing, distribution, sales, and shared warehousing). Additionally, fostering collaboration and connections among entrepreneurial teams (including identifying co-founders, investors, and customers) and investing in smart infrastructure, urban data analytics, as well as developing high-speed internet and cybersecurity, should also be prioritized.
- Development of neighborhood-based entrepreneurship and leadership of innovation and entrepreneurship intermediaries in the neighborhoods of Tehran: Supporting neighborhood-scale businesses is crucial, utilizing the resources of cultural centers and neighborhood houses to create entrepreneurial spaces and neighborhood-specific incubation centers that offer free facilitation services and affordable co-working spaces. It is recommended to manage the spatial distribution of the 50 existing creative and innovation houses in Tehran within neighborhood-focused incubation centers.
- Focusing on the development of social entrepreneurship and accelerators with a mission for social urban services: Empowering vulnerable groups in line with local business opportunities and micro- and home-based jobs, along with creating skill development opportunities in various workshops for female heads of households, individuals in prisons, substance abusers, and other vulnerable urban

populations, should be prioritized.

- Establishing centers for the development of micro and home-based businesses in the fields of food, handicrafts, and tourism in the neighborhoods of Tehran: it is recommended to establish specialized incubation centers for the development of micro and home-based businesses in the neighborhoods of Tehran, providing facilitation services and training for business development, including digital marketing, website design, and other related services.
- Organizing exhibitions and bazaars, regulating street vendors, and offering products in local markets of Tehran: It is recommended to organize exhibitions in selected venues, strategically locate bazaars with suitable accessibility in urban areas, regulate street vendors, support the sale of products and services from local businesses in shops, and develop industrial complexes in various neighborhoods of Tehran.
- Supporting the culture of entrepreneurship in civic education and urban communication and advertising: It is suggested to support the organization of entrepreneurship events, conferences, and seminars, recognize and honor successful entrepreneurs and owners of large, startup, knowledge-based, small, medium, and micro home-based businesses in the city, and leverage urban advertising in Tehran for awareness raising.

Given the limitations of the research, as the data is primarily based on legal documents and official programs, with the perspectives of actors and entrepreneurs not directly examined, it is recommended to adopt a field approach and conduct interviews with entrepreneurs and key institutions to assess the actual quality of collaborations and implementation barriers in future research. Moreover, a comparative analysis with regional cities (including Istanbul and Muscat) could provide a clearer understanding of cultural and institutional differences. In addition, given the limited research available, there is a need for deeper theoretical exploration and empirical studies on the development of the entrepreneurial ecosystem in urban planning. Such studies can enhance understanding of the causal relationships between entrepreneurship, innovation, and local and regional dynamics. Furthermore, for each of the policy recommendations outlined, future research should investigate specialized areas and the geographical distribution of incubation centers, innovation hubs, and accelerators, as well as identify strategies for achieving a balanced distribution. Despite numerous challenges—such as limited access

to financing, unfamiliarity of Iranian investors with investment opportunities, low-quality local coaching programs, and difficulties in commercializing products and accessing markets—it is recommended that future research analyze the obstacles to entrepreneurship development. This can be done by designing a soft systemic intervention, examining the diverse perspectives of stakeholders, and identifying targeted activities to address the barriers to entrepreneurship development that are relatively agreed upon by actors in Tehran's entrepreneurial ecosystem.

### Authors' Contributions

Samadi-Foroushani (40%): conceptualization, study design, data analysis, software, interpretation of results, drafting, and revising. Boochani (40%): conceptualization, study design, interpretation of results, and review. Keyhanpour (15%): data collection, data analysis, and interpretation of results. Behrouz (5%): data collection and data analysis.

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### Conflict of Interest

This article has no conflict of interest.

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