ARTICLE

JOURNAL`S UNIVERSITY OF BABYLON FOR ENGINEERING SCIENCES (JUBES)

مـــجلـة جـــامعة بـــابـل للعلـــوم الهندسية

Vol. 32, No. 5. \ 2024 ISSN: 2616 - 9916

"Spatial Potentials for Planning Innovation Clusters" Re-defining potentials of (UCIS) In Al-Exandria city in Iraq

Rashaa Malik Musa

University of Babylon, College of Engineering, Department of Architecture

Eng.rasha.malik@uobabylon.edu.iq

Received:	10/12/2024	Accepted:	24/12/2024	Published:	30/12/2024

Abstract

Competitiveness is the main characteristic that leads oriented firms in their location choices. The new economy based on innovation and implicit knowledge has close ties to space that stimulates innovation and the transfer of knowledge assets for keeping competitiveness. To sustain the process of innovation; it demands continuity of transferring of knowledge (intangible) and (tangible). The current research discusses the catalysts that the urban ocean context can provide to stimulate innovation in industries. Many studies showed that there is level of successful relation between clusters and urban and regional contexts as they interacted differently. Many industrial clusters in Iraqi cities suffer from issues in interacting with their surroundings. This research aims to discuss the role of site quality in enhancing the appeal of innovation clusters. What are the planning characteristics of these clusters? This issue will be discussed according to the review of the literature, and the analysis of studies of innovation clusters and urban context indicators. The research aims to introduce a model to assist the process of evaluation of urban context according to its drivers to integrate with certain types of innovation clusters. The hypothesis is that spatial model [UCIS] can provide guides for spatial policy for developing innovation dynamics.

The research methodology contains the following steps; put the research terms and definitions, define types of innovation clusters, and build a framework (territorial innovation model framework) that gives indicators of planning aspects that fulfill innovation needs.

Inductive results from the case study will assist in identifying and categorizing precise effective indicators as the conceptual framework. elucidates the basic characteristics of site quality for establishing or promoting innovation clusters for Al-Exandria city in Iraq. The main conclusion of the study is that the model of [UCIS] can be a method that assists in determining the various policies of interference in cities according to aspects and levels of integration.

Keywords: Cluster, Innovation, Spatial potentials, Quality of Place

Introduction

The location choice and regional/territorial development theories start from "the old and recent theories of industrial location like: Canonical theories (Marshall, Weber, Hoover, Lösch, Jacobs, among others) and contemporary approaches (new geographical economics, endogenous growth theories, new industrial organization theories, evolutionary theories, regulation theories), in economic sociology (social networks theories) or managerial literature (notably in strategic management, with Porter as a key figure) [1]. These approaches divided industry cluster into two types that are; the territorialized vs. non-territorialized conception of the concept of innovation-based cluster and activities.

Spatial links compared with pure-market relationships, give clusters more efficiency and flexibility of industrial organization. This will have manifested as vertical integration, alliances, partnerships, and networks [1]. Both formal mechanisms of industrial collaboration and informal inter-organizational and interpersonal relationships are essential components of most industrial and innovation networks. Knowledge is sticky in

space due to its tacit character, which makes it possible to create distinctive collective assets that boost business and regional competitiveness. [2] Local dynamics influence the evolution of a creative economy and creativity-driven urban development, as well as the amount and conditions under which this occurs [3].

Place connects to the concept of innovation in a feedback process; [4] The European Commission states that :

- Geographic closeness has a significant role in innovation processes.
- It leads to urban development through the development of research infrastructure and specialized equipment and facilities.
- Proximity also helps to develop regional networks of small and medium-sized companies. It plays a role as a site criterion in clustering around universities and corporate R&D centers of (multinational) companies.

Localized in addition to being a common justification against relocation or in favor of investment, knowledge spillovers from inter-firm links, a flexible labor pool, and robust innovation-related infrastructures can be a real source of productivity gain for businesses. [5]

Understanding local dynamics is fundamental for interpreting the concept of clustering in successful policy-making. Understanding the functions of all participants and mechanisms involved in the process is essential [3].

Innovation propels competition, and competition stimulates economic growth as stated by Porter. Local clusters are vital for innovation and growth, as they indicate emerging client wants and accelerate the innovation process. Contrarily, innovation is pursued for (inter)national markets rather than local or regional ones. invention is not primarily a function of collaboration and knowledge exchange, as the majority of invention occurs internally. Clustering appears to lack support for links with other institutions, suggesting that (inter)national cooperation is more significant than local cooperation. [6]

Clusters are significant concentrations of exceptional competitive achievement in specific domains. Clusters are spatial groupings of interrelated enterprises and institutions within a specific sector. Clusters comprise a collection of interconnected industries and entitwies vital to competition [1].

- Clusters foster both rivalry and collaboration. Clusters signify a novel organizational structure that facilitates an alternate method of value-chain organization.
- Consequently, clusters alleviate the issues associated with arm’s-length interactions without necessitating the flexibilities and integration of connections required to address the management concerns of establishing formal links such as networks, alliances, and partnerships.”[1]
- A cluster of independent and informally connected entities (industries and institutions) constitutes a strong organizational structure that provides benefits in efficiency, effectiveness, and adaptability.
- Cluster network based on: two integrated dimensions (first) the links actors in context of geographical proximity, and (second) the existence of both competitive and co-operative interactions amongst the co-localized firms [1].
- Clusters, according to form, defined by their areas of specialization, and according to their function, function within specific geographical regions and engage with broader innovation ecosystems as critical elements in a nation's ability to draw foreign investment that fosters new technological knowledge, captivates investors in innovation, and attracts skilled labor. [6]
- Custer can merge all spatial possible scopes within a global undifferentiated framework through a virtual innovation network “a global virtual learning environment. Clustering has a great contribution to innovation and regional- economic growth. Clustering will create an innovative ecosystem for researchers, entrepreneurs, students, and the academic community through the advancement of urban architectural design and infrastructure development. [3],[7]

Innovation clusters usually vary according to the diversity of inputs. The innovation clusters types: [8]

First: diverse" innovation clusters are grouped as Co-located firms that do not specialize in the same industrial sectors.

Second: "Specialized" innovation clusters refer to groups of co-located enterprises that focus on the same industrial sectors, however lack substantial evidence of collaboration inside the cluster.

Third: "R&D Collaborating" innovation clusters are groups of co-located enterprises that engage in collaboration within the cluster.

Fourth: cooperation "communities characterized by dispersion" communities of innovation – Clusters of enterprises that collaborate yet are physically dispersed and not situated in a single location.

Spatial terms related to the definition of innovation clusters

1. **Regional innovation systems**: this term relates and discusses the aspects policies of regional economic development and science and technology. The European Commission placed significant emphasis on regional aspects of innovation at the supranational level as a crucial component in creating long-term competitive strength [2].

- At the national level, there is a shift from redistribution-centric policies, often aimed at specific disadvantaged regions and based on conventional investment-driven growth theories, to national regional economic policies that emphasize the structural determinants of growth concerning regional innovation capabilities [4].

-In addition, there is an almost limitless array of valleys, corridors, and highways at the regional and local levels that are vying to be the next major hub for innovation. Using Silicon Valley, Toyota City, and other common regional growth miracles as examples, policy officials aim at the public conditions suitable for innovative business development [9]

The family tree of territorial innovation models elucidates regional economic development by interpreting regional competitive advantage through collective learning processes. Regionally integrated enterprises can be considered as encompassing regional innovation systems as a subset. Conventions in structured marketplaces, rooted in social, institutional, and cultural settings, promote economic participation [2].

2. **Innovation Districts:** a sustainable economic growth model; a locale engaged in the creation and management of innovation; these are characterized as "a specific geographic area, typically within an urban setting, where dense populations are employed in knowledge-intensive sectors alongside other affiliated enterprises and institutions", also they create a favorite place to live. These spots are characterized by the diversity of land use, concentration, prosperity, and social attractiveness for knowledge elite, [10].

The Global Institute of Innovation Districts (GIID) states that it partners with 23 districts throughout multiple regions, including Asia, Europe, North America, the Middle East, and Australia. GIID has collaborated with Innovation Districts in Mexico and Colombia within the Latin American area. The GIID emphasized the benefits of innovation-driven economic growth by citing the economic influence of The Cortex Innovation Community in St. Louis, Missouri, which generates about $2 billion in area output each year [11].

3.Smart city: Innovation connects the definitional elements of a smart city, which relies on technical and urban capital. Smart city innovation transpires inside infrastructures and procedures to actualize visions[12] In the smart city concept, aspects like Distance, location, place, and space remain significant for the urban innovation. In-person interaction among individuals is of paramount significance. The closeness of individuals is an essential prerequisite for vigorous communication and knowledge sharing. [12]

Urban proximity offers economic and technological attractiveness to cities in the context of agglomeration economies.

Innovative firms and individuals will persist in congregating in designated areas such as financial districts, industrial zones, and cultural hubs. The concentration of talent and creativity in urban agglomerations fosters innovation; greater talent density correlates with increased innovative output. The foundation of such districts through the city doesn't lead to urban equality or social justice. So in the same city neighborhoods it's likely to find different levels of accessibility and usability of traffic systems, digital infrastructures and other services. [12] But this represents a strong support to the research hypothesis, and these clusters likely motivate prosperity throughout city parts if their spatial potentials were employed. Policy interventions emphasize the region's soft infrastructure regarding institutional capability; governments can implement cluster policies with little budgetary implications relative to expenditures in "hard" infrastructural assets. Fourthly, localized knowledge spillovers resulting from inter-firm linkages, a diverse labor pool, and robust innovation-related infrastructures can serve as a compelling case against corporate relocation. [2] The spatial relationships and externalities of the clusters will enhance the potential of the urban area. Distrito Tec seeks to establish an innovation environment for researchers, entrepreneurs, students, and the academic community through the development of urban architectural design and infrastructure planning. [7]

Knowledge of architecture and urban context:

Clustering is mainly, related to two types of approaches to knowledge transferring; spatial dynamics and collaboration network of clusters. The size of the city was one of the basic variables that addressed most of the studies of clustering. From the cluster side, the factor of the size of clusters affects relative partnerships at a spatial distance. The research investigating the connections between the creative economy and regional development predominantly centers on major cities and metropolitan regions. [13] Density, diversity, and tolerance constituted the primary competitive disadvantages regarding clustering in small towns (the example study). Nonetheless, creativity-driven tactics are effectively employed in various small towns globally to revitalize and diversify their local economies in reaction to industrialization, globalization, and digital advancements. [13]

Innovation Cluster in its urban context can be in the form of a specific institutional frame, or what is labeled as" Knowledge architecture", table [1]

Table [1] a relative terms, the researcher based on Pinch et al [3] &[14]

Innovation context	Urban context
K -clusters and K –hubs	The terms "agglomeration" and "cluster" are used interchangeably to denote spatial concentrations of enterprises, regardless of size.
Local Innovation Systems	nodes inside networks of knowledge generation
Epistemic landscapes	Companies united by a shared interest to leverage competitive advantages. clustering
Shaping Epistemic Landscapes	relevant development policies
knowledge Mapping	allocation of resources such as education, research and development, and communication
Innovation Intensity	Proportion of employees engaged in knowledge-

	intensive activities per geographic unit.
Innovation Performance	concrete results produced each year by the innovation community
Innovation Impact	advantages to the wider community stemming from the advancement of knowledge-intensive endeavors.
Innovation Space Determination:	The favorable correlation between distance and transaction costs pertains to various conceptualizations of space, including geographical, cognitive, organizational, institutional, and cultural dimensions.

Government tactics are employed in Malaysia and Indonesia to cultivate knowledge-based societies and economy by influencing epistemic landscapes alongside pertinent development policies.

The epistemic landscape of knowledge clusters will delineate the gaps, troughs, and peaks of knowledge assets within a specified region. It will provide more precise targeting of developmental initiatives, akin to poverty mapping. Knowledge mapping serves as a strategic planning instrument, facilitating the assessment of the impacts of development activities across the fields of communication, research and development, and education. Epistemic landscapes will highlight the locations accessible for information and development activities when information or decision support systems are implemented. The proper implementation of sustainable knowledge architecture for development necessitates the mapping of epistemic landscapes. [14]

"West Yorkshire Combined Authority for example, focused on geography with more traditional location analysis and identified priority clusters and sectors. There are collaborations between organizations in different clusters based on a collaboration network.[8] Spatial map of clustering activities will provide a real picture for authorities, policymakers and researchers to explore the potentials of enriching the spatial dynamics of innovation [8]

This could be a later stage of activating the agglomeration with spatial factors or it could be the starting point to be followed by the process of building spatial links at the agglomeration site.

Methodology

The definition of basic aspects of methodology depends on the cluster concept and the process of innovation. From the dissection of these two concepts, certain spatial aspects will be illustrated.

This study will adopt an inductive approach and a planned conceptual framework will be used. The conceptual framework elucidates the overarching elements of location quality for fostering innovation clusters, while inductive findings from case studies will aid in identifying and categorizing specific useful indicators from the analysis.

First: Building the comprehensive model

[UCIS] is the proposed model through this research, which represents the basic dimensions of an integrated and comprehensive framework for assessing the spatial potential of planning innovative clusters in cities, a four-way model that expresses the integration of tangible and intangible dimensions at the macro and micro levels of the urban environment of any innovative cluster and according to the research hypothesis, which stated smart combination of spatial and infrastructure policy can provide a welcoming atmosphere for the innovation process and knowledge dynamics. The dimensions included in the spatial assessment form will be detailed.

First; the innovation system which consists of economic activity of an innovative nature and existing networks to activate knowledge exchange to develop products and raise production efficiency. The shift from a

neoclassical economy centered on manufacturing to one centered on innovation and information Generation has been sped considerably by digital disruption centered on the creation of suitable venues to promote economy. As a result, innovation clusters have focused more on meeting the demands of workers and knowledge industries, paying special attention to quality-related concerns to draw in these individuals.

From the above definitions of the cluster, we can determine the related variables that give spatial identity of the cluster [4]:

- Concentration of specific types of land uses
- Concentration of specific types of actors
- High intensive interactions
- Feedback relations with the urban context (demographically and physically)

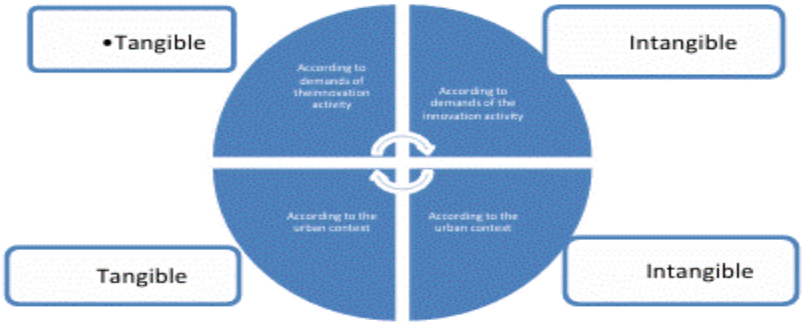
So, form and function of the cluster are defined as spatial planning aspects. On the other hand, the process focused on innovation rather than on the product itself.

Second: Urban context and its influence on the idea of innovative clusters has generally been associated with global and regional levels, while studies have suggested the impact of soft and tangible forces on the site-specific context of the city in which these clusters appear .Yigitcanlar, Tan, 2013, Florida, Richard 2002 [15], Ergazakis,2004 [16], and Zhong 2012 [17],are the best example of these studies. They focused on the link between the urban dimension and the incentives of the identity of cities and innovation processes in economic activities and the role of urban location and societal context in stimulating the attraction of elite researchers and creators in various economic and scientific activities.

R.musa2021 ,2023classified Several dimensions of cognitive strategies that stimulate innovation at the urban level. [18],[19]

The proposed model is a continuation of the methodology of these studies with an attempt to produce a comprehensive model that results in a matrix of evaluation indicators that are a viable tool.

(UCIS) or Urban context for catalyzing innovation system is the main concept of this study which is shown in Figure [1]. This figure illustrates the basic concept of innovation aspects that can be translated into factors that targeted spatial planning.



Fig[1] Aspects of spatial potentials that targeted spatial planning (UCIS) [the researcher]

According to Figure [1] the main classification of innovation clusters will be defined with terms of form, function, scale, and network. These terms need to be explained in two levels; cluster and its context, table[1].

Terms and indicators produced by each of the mentioned studies will be analyzed and reorganized according to the model shown in Figure (1),and then the terms will be organized according to the dimensions and levels included in the comprehensive framework proposed in Figure (1). First, a set of indicators associated with each of the term of the model will be analyzed according to several sources.

First: UK Innovation clusters:

It is especially beneficial for identifying industrial hotspots and areas with growth potential. It will assist locations in comprehending their strengths and serve as a valuable instrument for formulating innovation plans that will enhance and capitalize on prospective synergies. The Analytical Report Identifying and Describing UK Innovation Clusters outlines four criteria to evaluate whether business aggregations qualify as innovation clusters:[8],[20]

1.R&D&I activities

2. Spatially co-located

3. Involved in associated activities, such as operating within the same value chain or manufacturing analogous items.

4. Engaged. collaborating on publicly financed research and development projects among organizations within the same group.

Second: NRC cluster initiatives

The NRC has significantly contributed to the development of two prominent technology clusters in Canada: The biopharmaceutical cluster in Montreal and the agricultural biotechnology cluster in Saskatoon. Recognizing that improved innovation performance in Canada's regions and communities is vital for national growth, and in accordance with the federal government's vision for innovation, commercialization, and economic development, the NRC launched multiple technology cluster initiatives to promote the establishment of new clusters. The NRC has specified four objectives for these initiatives.

This study analyzed the cluster according to current and development conditions. The factors related to these conditions were: Supporting organizations, Competitive environment, and Product development capabilities.

Third: Studies of R.musa 2021,2023:

The studies of R.musa 2021, and 2023 discussed three main strategies that focus on spatial potentials and their role in motivating innovation in the city, and these are; agglomeration, networks, and urban capital. These studies concluded the importance of integrated perspective of these development strategies. [18],[19]

Fourth: Study of Yuye Zhou, Yukun Li, & Yi Wang 2019:

The study directed to highlight on the importance of improving the spatial impact of clusters that depends on innovation process. The main discussion is based on several mechanisms directed to creating a collaborative environment that influence innovation networks. [21]

Table [1] Terms and aspects of spatial potentials that targeted spatial planning (UCIS) according to previous studies (the researcher depending on,[15],[16],[17],[18],[20]

previous studies	Terms	Aspects	
	Level of considerations	Tangible	Intangible
UK Innovation clusters	Urban context	• water and waste • Numbers of firms. Size of city • Type, and location of clusters • regional proximity	• Positive social externality (such as social work and care, arts, and recreation • The talent pool, land space, and accessibility
	Innovation context	• Number of clusters per • Sector, and the average turnover or employment per sector • R&D funding distribution across sectors • private than public funding per firm • Consumer surplus capture is easier (such as E-commerce and Advertising	• Strong collaboration networks span across long distances between research intensive universities, research organizations, and firms' collaborations between clusters of the same sector
NRC cluster initiatives	Urban context	• Community support organizations • Local availability of materials and equipment • Local availability of business services • Human resources • Transportation	• Local Involvement • Local activity Distance of competitors • Distance of customers • Business development capabilities • availability of capital • Quality of local lifestyle
	Innovation context	• Size of cluster firms • The number of cluster firms • Number of spin-off firms	• Business climate • Access to qualified personnel
Studies of R. Musa 2018,2020:	Urban context	• Infra structures & land use	• City branding • natural

		• Availability of land suitable for expansion	-historical focal points • diversity of urban capital
	Innovation context		
Yuye Zhou & others 2019	Urban context	• open space availability • Non –open space availability • Knowledge infrastructure • Academic institution availability	• Platform for creating a knowledge exchange space
	Innovation context	• Network • Supporting Facilities	• Collaborative system

The studies referred to indicators that link urban potential and innovation clusters stimulation, these indicators will be organized according to the dimensions and levels that form the integration function model to measure spatial potential.

Table[2]. Terms and Levels of Spatial Planning Considerations for (UCIS) [the researcher]

	Tangible		Intangible		
	Terms	Measurements	Terms	Measurements	
urban context	Land availability	Statistics & survey	Diversity Quality of local lifestyle	questionnaire	Terms of form[F1]
Innovation cluster	Densities	numbers of firms Size of cluster firms	Hot spot	No. of hot spot	
urban context	Human &natural resource land use	Statistics & survey	Community support	No. of these organizations &Local activity	Terms of function [F2]
Innovation cluster	Variety	No. of firms with different specialties &Local availability of materials and equipment	Business climate	questionnaire	
urban context	hierarchy	Statistics& administrative	attractiveness	No. of visitors	Terms of scale[S]
Innovation cluster	availability of capital	Survey of different types of capital (human technology, financial, etc.	competitors & customers	Distance of competitors Distance of customers Survey and mapping	
Urban context	Infra structures (transportation)	Survey of transportation infrastructure	City branding natural -historical focal points	City branding strategies No. of valuable buildings	Terms of network [N]
Innovation cluster	positive social externality	such as social work and care, arts and recreation, water and waste	Access to qualified personnel	No. of qualified person	

After determining the levels of planning consideration for both –the innovation context" and -urban context", an analytical matrix will be defined according to the inputs of the localities context under study.

After the indicators for each of the model items have been determined, the matrix relationships are determined vertically and horizontally to express the integration probabilities of the dimensions and levels that define the model.

Terms that shown in Table (2) will extrapolated and results will be analyzed of extracted from the applied situation (industrial clusters and their urban surroundings in the city of Al-Exandria in Iraq) and to fill in the matrix shown in Table (2) it is necessary to standardize the specific indicators to produce the target evaluation of the terms of the model [UCIS]. This will be done by expressing the results of the study of the reality of the situation in a numerical verbal evaluation method consisting of degrees represented in the matrix, which express the (indicators of the urban context), (indicators of the innovation cluster), and this method will be adopted for evaluation due to the lack of a globally unified standard that the results can be compared to, as this method is flexible and subject to the contexts of the case studied, thus providing a perception of a degree of objectivity for the required state of integration according to the results. To ensure an objective evaluation of the matrix inputs, sources of input will be the city's residents and experts working in the facilities under study.

Table [3] questionnaire, assessment for: [good [+1], to some extent [0], bad [-1]]

	Tangible				Intangible				
	Terms	+1	0	-1	Terms	+1	0	-1	
urban context	Land availability٩ :				Diversity Quality of local lifestyle				Terms of form[F1]
Innovation cluster	Densities				Hot spot				
urban context	Human &natural resource land use				Community support				Terms of function[F2]
Innovation cluster	Variety				Business climate				
urban context	hierarchy				attractiveness				Terms of scale[S]
Innovation cluster	availability of capital				competitors & customers				
Urban context	Infra structures (transportation)				City branding				Terms of network[N]
Innovation cluster	positive social externality (				Access to qualified personnel				

Case Study

The city of Al-Exandria is located 50 km to the south of Baghdad and contains the largest industrial facilities in Iraq. Where the foundation of most of these large industrial facilities during the late 1960s, and these facilities are:

- The General Establishment for the Automotive Industry.
- General Establishment for Mechanical Industries.
- Thermal Power Plant Facility (the second largest power plant in Iraq)
- The Hattin State Facility (which was dismantled after the 2003 invasion of Iraq, as it was used for military industrialization).
- Gas power plant facility (adjacent to the current thermal plant).

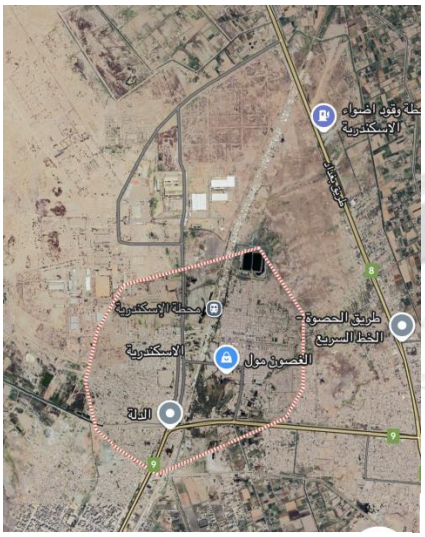
Social life: According to 2016 estimates, the population is about 200,000 people of which 55% are young. The location is close to the capital and surrounded by various transportation routes from vehicles and railways, relatively proximate to international airports; Baghdad Airport 67 km and Najaf Airport 142 km. Agriculture is one of the main pillars of Al-Exandria 's economy, as fertile land provides great opportunities for the production of crops, which supports the local population and provides income. Al-Exandria has social and ethnic diversity with strong social ties between residents, as the local culture reflects traditions inherited from previous generations, and this is reflected in festivals and social activities.

Urban development: Over time, Al-Exandria has witnessed a growth in infrastructure and services, which has helped to improve the quality of life in some areas.

Tourism Development: Khan in Al-Exandria , Iraq, is the main landmark that attracts visitors, and tourists from inside and outside Iraq, which contributes to strengthening the tourism sector, increasing local income, and bening surrounded by marketplaces that providing a platform for local traders which enhances increases in economic opportunities. The marketplace also, provides a space for local artisans and artists to display and sell their works, helping to preserve cultural heritage and promote traditional industries.

Infrastructure: Despite improvements in some areas, Al-Exandria’s infrastructure needs further development, especially in the fields of transportation, transportation, and sanitation. Environmental pollution: Al-Exandria faces some pollution-related problems, whether due to industrial or agricultural activities, which negatively affect the local environment and public health.

ARTICLE
JOURNAL`S UNIVERSITY OF BABYLON FOR ENGINEERING SCIENCES (JUBES)
مـــجلـة جـــامعة بـــابـل للعلـــوم الهندسية
Vol. 32, No. 5. \ 2024 ISSN: 2616 - 9916



Location of industrial cluster


Urban center of Al-Exandria City


Site plan of industrial clusters

Fig[2] industrial clusters and the urban context of Al-Exandria City [the researcher according to Google maps and survey]

Results of survey of industrial clusters and the urban context of Al-Exandria City:

First: terms of tangible and intangible aspect of the urban context:

- Land availability: the total area of the city for various activities is 283 km2 most of this area is available for expanding urban development. The industrial clusters contain two industrial sites that are divided into two plants of mechanical industries and the site area is for all its factories 146208 m2, and Hitten establishment which has an area of 50000 m2.
- Quality of local lifestyle: The number of employees in the General Facility for Mechanical Industries reached 2800 individuals and the number of employees in the Hittin facility reached 6194 The percentage of expatriate workers in the facilities represents 35%. Diversity of housing style of Horizontal housing style, the old Kasbah, and the modern village. Three vertical housing complexes, Hittin Buildings, Complex of Industrial Housing, and Complex of modern village. Recreational services are provided in the form of a large number of recreational shops such as cafes, restaurants, and a gym, in addition to three large parks and a linear park adjacent to the river surface and infrastructure of the basic services are available in all parts of the city, including the Internet.
- Human &natural resource and land use: The population in Al-Exandria, according to the latest statistics, is 200 thousand people, half of whom are young people between 15-35 years, according to the 2024 census.
- Community support: Most of the city's residents depend directly or indirectly on industrial clusters, either because they work within them or because they work in the consumer services sector and real estate. The number of civil society organizations have been established, most

notably the organizations supporting the heritage of Al-Exandria and the Al-Exandria Madinaty cluster.

- Hierarchy: the city of Al-Exandria is classified as an administration unit of the Musayyib District within the Babylon Governorate.
- Attractiveness: the city is witnessing a turnout of tourists for religious visits and cultural tourism, as the city represented in the seventies and eighties of the twentieth century a work destination and housing for high percentages of engineering specialists and technicians from inside Iraq and experts of foreign and Arab nationalities.
- Infra structures (transportation): the city is located on a node of land transportation roads represented by the public road network and the highway linking northern and southern Iraq and railways, as it is located 64 km from Baghdad International Airport It has a land transport station.
- City branding: There are four sites of architectural and historical importance within the city; Khan Al-Waqf, the Great Mosque, religious shrines, and the cemetery. There is no declaration of any official strategy for city branding, but some cultural events are held annually in 2023 and 2024 (three events). There are several archaeological sites in the city.

Second: terms of tangible and intangible aspects of the innovation cluster:

- Densities: the number of employees in the Hittin facility is 6194 people and the number of employees in the General Establishment for Mechanical Industries 2800 people.
- Hot spot: a field survey was conducted for the activities that fall within this classification, and Internet cafes include freelance spaces, cultural forums, and scientific forums, which are spread within the main nodes in the city with a decrease in equipment and spaces.
- Variety: Number of firms with different specialties &Local availability of materials and equipment. Many facilities and factories existing in the city which are :

1. General Automotive Manufacturing Facility.
2. General Establishment for Mechanical Industries.
3. Thermal Power Plant (the second largest power plant in Iraq).
4. The Hittin State Facility (which was dismantled after the 2003 invasion of Iraq, as it was used for military industrialization).
5. Gas power plant facility (adjacent to the current thermal plant.

The State Company for the Automotive and Equipment Industry was founded in early 2016 by the merger of three organizations: and the State Company for the Automotive Industry, the General Company for Mechanical Industries, and the State Company for the Manufacture of Batteries. It is associated with the Ministry of Industry and Minerals and presently focuses on engineering industries, which comprise the majority of its industrial and agricultural activities.

- Business climate: the Hittin facility has been under constant downtime for 20 years while the General Facility for Mechanical Industries continues to operate at low capacity.

- Availability of capital: this survey includes different types of capital, which include; human, technology, financial, and educational. The city contains one college facility, which is the Technical College, and it contains several disciplines, including technological specialization and agricultural specialization it was added to the Middle Euphrates Technical University developed in 2014. City also contains several vocational institutes, including the Vocational Training Institute, and the Technical Institute – Project. The State Company for the Automotive and Equipment Industry was established in early 2016 following the amalgamation of three entities: the State Company for the Automotive Industry, the State Company for Mechanical Industries, and the State Company for the Manufacture of Batteries. The aggregate expenditure for the sanctioned investment projects is projected to be 112.5 billion dinars. Some of the company's factories were granted the [ISO9001] certificate before the establishment.
- Competitors &customers (Distance of competitors Distance of customers): the establishments under study are government establishments and are the only ones of their kind at the national level, so there is no competition and the product market includes all parts of Iraq.
- Positive social externality (such as social work and care, arts and recreation, water, and waste: The old Kasbah in the city lacks sewage networks, while these networks are located in the vertical housing complexes and the modern village complex to house the employees of the establishments. The city has some social clubs and is currently ineffective.

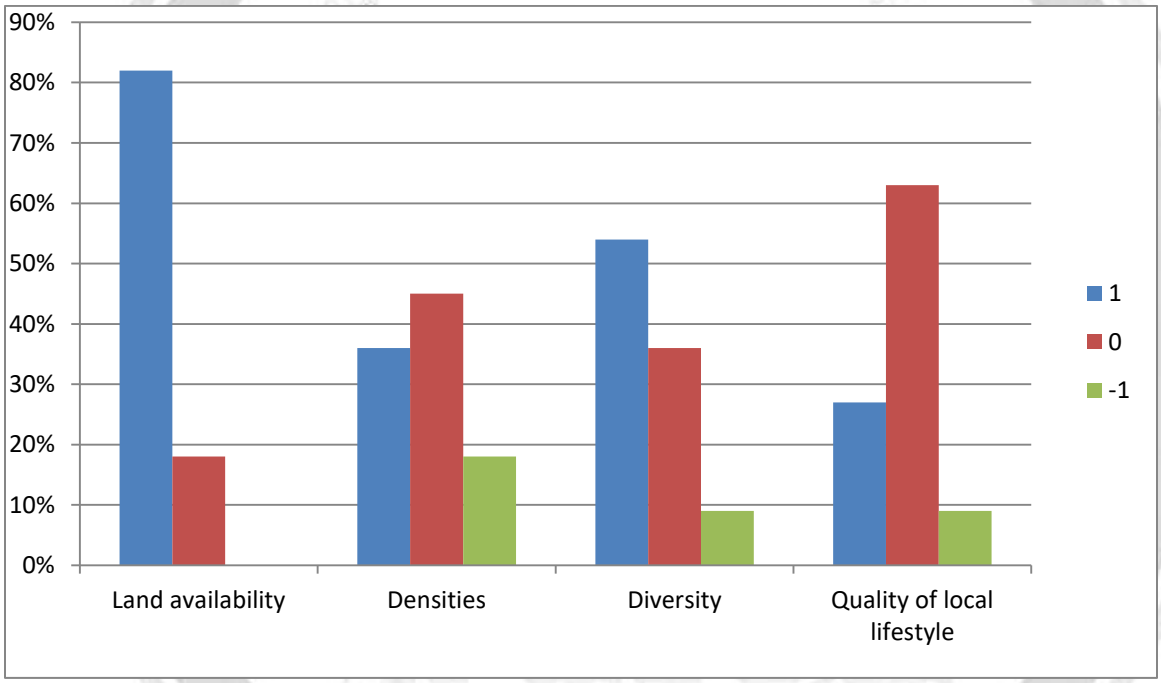
Results of the questionnaire and Discussion

The questionnaire was conducted within a research sample consisting of sixty individuals that included experienced individuals and workers in industrial facilities in the city of Al-Exandria, and those who lived in the city for more than five years, because they experienced the place and have a real assessment of the spatial dimensions included in the evaluation form. Table [4]

Table [4] Questionnaire results [the researcher]

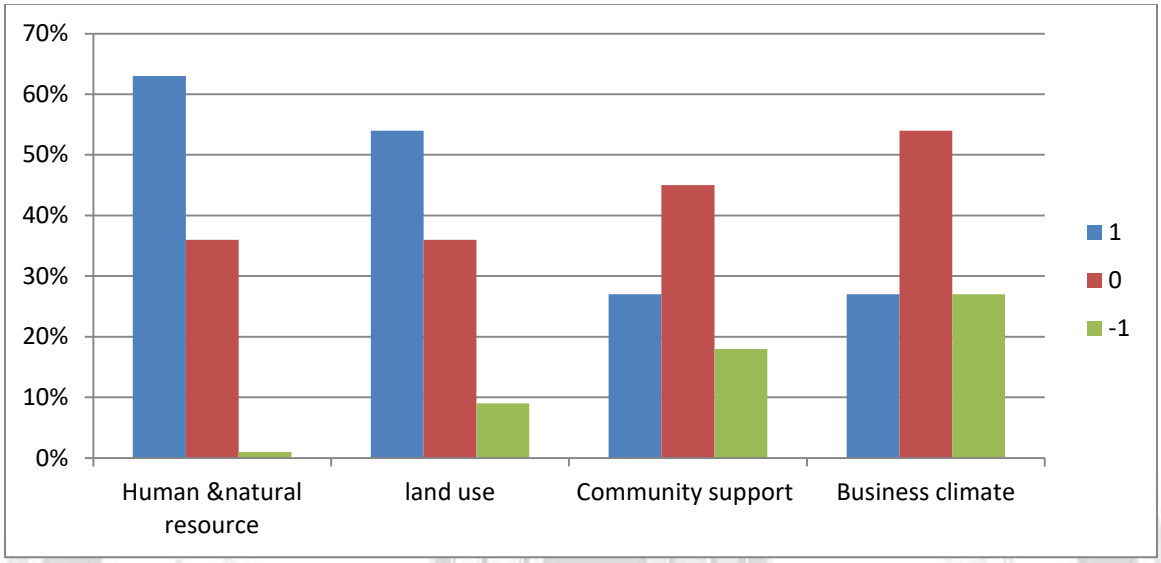
	Tangible[T]				Intangible[IT]				
	Terms	+1	0	-1	Terms	+1	0	-1	
Urban context[UC-F1]	Land Availability	82 %	18 %	0%	Diversity Quality of local Lifestyle	54%	36%	9%	Terms of form[F1]
Innovation cluster[ISF1]	Densities	36 %	45 %	18 %	Hot Spot	27%	63%	9%	
urban context [UC-F2]	Human &Natural resource land use	63 %	36 %	1%	Community Support	27%	45%	18 %	Terms of function[F2]
Innovation cluster[IS-F2]	Variety	54 %	36 %	9%	Business Climate	27%	54%	27 %	
urban context [UC-S]	Hierarchy	9%	63 %	27 %	Attractiveness	9%	36%	54 %	Terms of scale[S]

Innovation cluster[IS-S]	Availability of capital	18 %	45 %	36 %	Competitors & customers	27%	45%	36 %	
Urban context [UC-N]	Infra Structures (transportation)	0	90 %	10 %	City Branding	9%	54%	36 %	Terms of network[N]
Innovation cluster[IS-N]	positive Social Externality (	0	63 %	36 %	Access to Qualified Personnel	45%	45%	10 %	

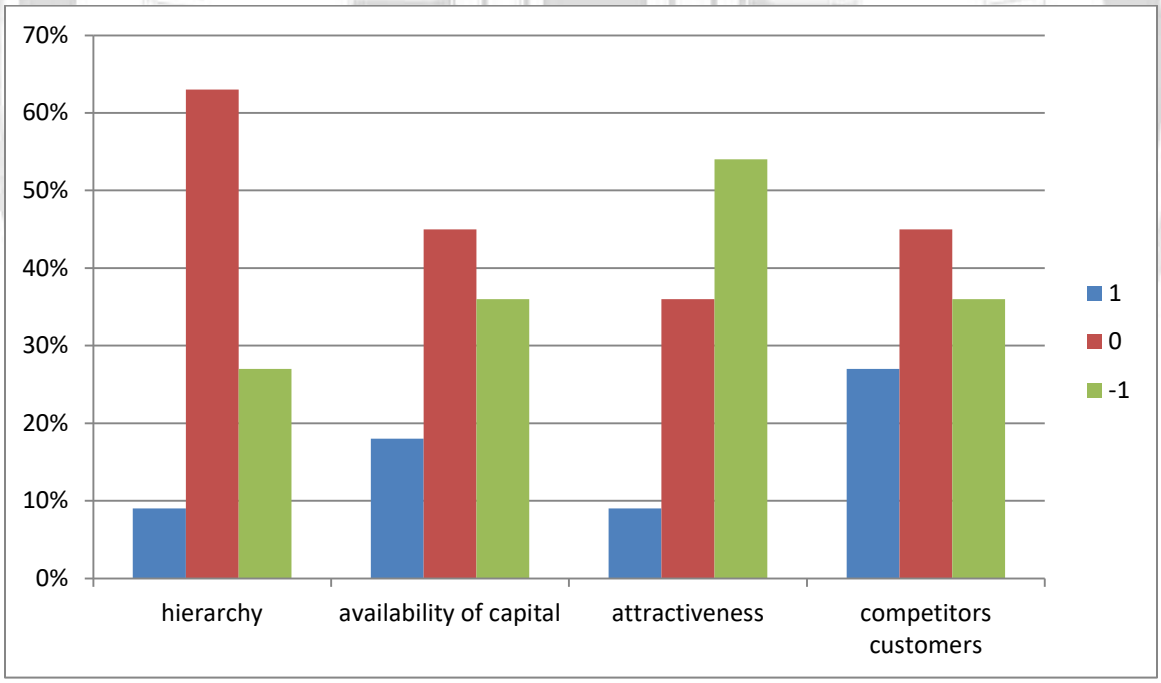


Fig[2] Terms of Form [F1]

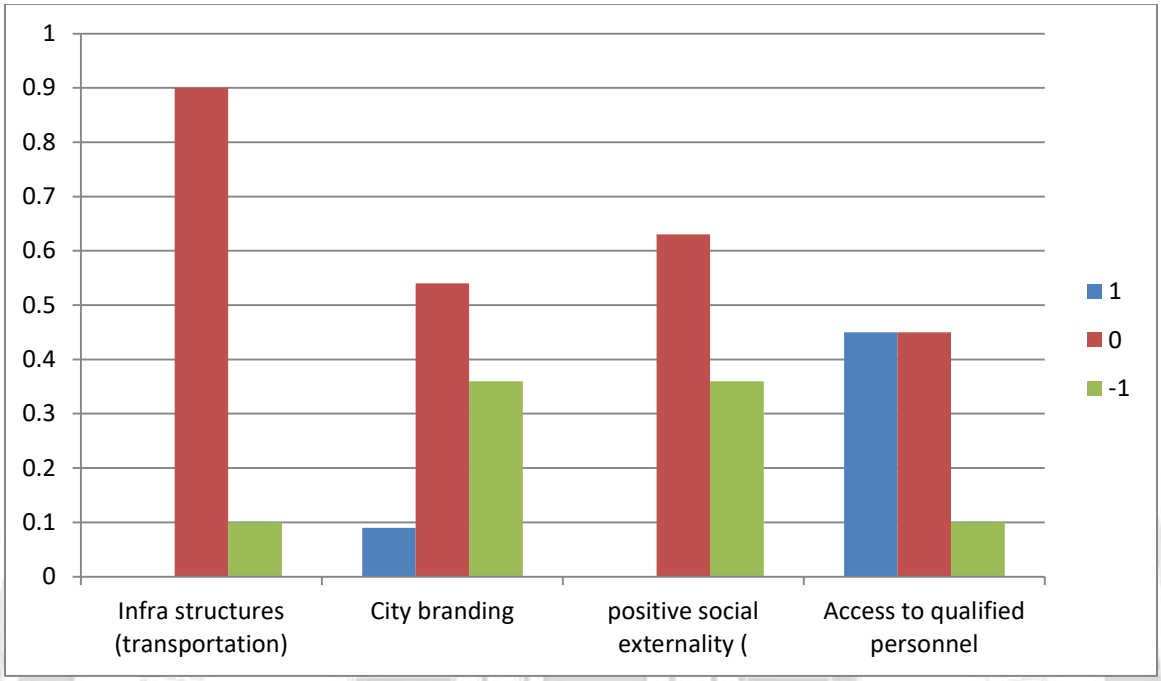
ARTICLE
JOURNAL`S UNIVERSITY OF BABYLON FOR ENGINEERING SCIENCES (JUBES)
مـــجلـة جـــامعة بـــابـل للعلـــوم الهندسية
Vol. 32, No. 5. \ 2024 ISSN: 2616 - 9916



Fig[3] Terms of Function [F2]



Fig[4] Terms of Scale [S]



Fig[5]Terms of network[N]

The results of the questionnaire showed the following:

First: In the axis of intangible dimensions:

The indicators of the vocabulary in the intangible dimension achieved higher percentages in the low evaluation field (0, -1), where the percentages were equally concentrated for the results of the low evaluation in the vocabulary field of the industrial site, and the urban environment in Al-Exandria for the vocabulary of vital contract density, work climate, competition, market and the availability of knowledge elites and experiences.

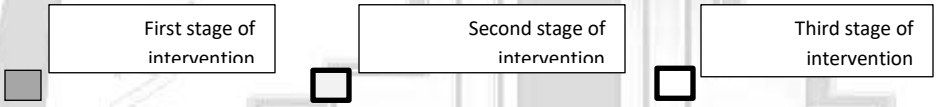
Second: The axis of tangible dimensions:

The indicators of the tangible dimensions achieved higher percentages in the low valuation field (0,-1) to a neutral degree between the urban surroundings of Al-Exandria, and the industrial site. The highest percentages of low evaluation results were achieved in the vocabulary of density, diversity, availability of capital, and positive external savings at the level of the industrial site, while the highest percentages of low evaluation results were achieved in the vocabulary of urban surroundings, which include land use, human and natural resources, urban hierarchy, infrastructure, and transportation network.

Third: By comparing the results of the vocabulary for both the urban environment and the industrial site, the following appeared :

- The urban environment achieved the highest rates in the field of high assessment of the availability of land and the availability of human and natural resources in the tangible dimensions in the diversity and quality of local lifestyle in the axis of intangible dimensions.
- The industrial site achieved the highest percentages in the low evaluation field in the tangible dimensions axis in the density and diversity vocabulary, while it achieved the highest percentages in the high evaluation field in the intangible dimensions axis in the single access of human competencies and expertise.
- Fourth: The results of the questionnaire showed compatibility in the vocabulary results for both the industrial site and the urban environment, and the consensus appeared in the vocabulary results for the tangible and intangible dimensions in the middle and low evaluation fields (0, -1), while the concentration of the highest percentages appeared in the high evaluation field (+1) in the urban environment vocabulary for the tangible dimensions and the industrial site vocabulary for the tangible dimensions.

Table [5] Zone of concentration of future spatial policies in the study area according to the hypothetical model of spatial integration (UCIS) [the researcher]



	Tangible[T]				Intangible[IT]				
	Terms	+1	0	-1	Terms	+1	0	-1	
Urban context[UC-F1]	Land Availability	82 %	18 %	0%	Diversity Quality of local lifestyle	54%	36%	9%	Terms of form[F1]
Innovation cluster[ISF1]	Densities	36 %	45 %	18 %	Hot Spot	27%	63%	9%	
urban context [UC-F2]	Human &Natural resource Land use	63 %	36 %	1%	Community Support	27%	45%	18 %	Terms of function[F2]
Innovation cluster[IS-F2]	Variety	54 %	36 %	9%	Business Climate	27%	54%	27 %	
urban context [UC-S]	Hierarchy	9%	63 %	27 %	Attractiveness	9%	36%	54 %	Terms of scale[S]
Innovation cluster[IS-S]	Availability of Capital	18 %	45 %	36 %	Competitors & Customers	27%	45%	36 %	
Urban context [UC-N]	Infra structures (transportation)	0	90 %	10 %	City Branding	9%	54%	36 %	Terms of network[N]
Innovation cluster[IS-N]	Positive social externality (	0	63 %	36 %	Access to qualified personnel	45%	45%	10 %	

Conclusions

The new economy depends on stimulating innovation systems in industrial establishments. The innovative cluster represents the model cities that can develop innovative systems, including the city of Al-Exandria in the province of Babylon. Image provided by international experiences in this regard. Many industrial facilities are spread in Iraqi Innovative clusters in Iraqi cities have shown different levels of interaction with their urban and regional surroundings. This study adopts an integrative approach that links the innovation process to the characteristics of urban contexts and takes into account the concrete and intangible nature of the innovation process as the main pillar of the new economy. According to previous studies on the subject, the spatial potentials that promote the innovation process and stimulate the innovative clusters are related to the local contexts within which the cluster arises. This study formed a framework that links the two pillars (indicators of the urban context) and vertical (indicators of the innovation cluster) according to a division of these indicators into tangible and intangible. The model adopted in this research represents a closer approach to integration in the scope of studying and stimulating innovation systems in the economic and industrial fields, especially because it takes into account the dynamic nature of the innovation process and its link to spatial extents that expand outside the scope of the institution.

The City of Al-Exandria (the local case study) suffers from many problems that affect the quality of urban life. On other hand, the industrial facilities suffer from deterioration in both physical and functional structures. According to the result of the application of the measurement model [UCIS] in the local case, the spatial terms that achieved the lowest percentages of integration between the urban environment and the industrial cluster were determined. Terms of the form[F1]: spatial policy needs to interfere in the level of urban context to assist the quality of life, and at the level of cluster, it needs interfering in rising densities of industrial land use and hot spots. Terms of the function [F2]: spatial policy needs to infer in maintaining community support and developing the human capital in the local community. Terms of the scale[S] and Terms of the network [N] were both the fields that needed policies that employed urban capital of the city to enhance network, production chain, and attractiveness of the city. The previous policies can combined with more community attaching to the industrial clusters by employment policy, catalyzing attractive land use, and quality infrastructure.

Recommendations

This model has the possibility of expanding vertically to detail a larger number of indicators that explain spatial potentials. It can also expand horizontally to adapt mathematical functions. Future research can also be put forward on the production of quantitative equations that link the result of the numerical evaluation of the indicators. Spatial potentials are related to the requirements of the industrial cluster. Authorities should pay attention to focusing on human capital, quality of the place, uses of land, and services, and the marketing of the archaeological sites in the city. These actions can promote social interaction: Provide a venue for social gatherings and cultural events, contributing to strengthening community ties and reviving heritage.

References

[1] A. Hamdouch, “Innovation Clusters and Networks: A Critical Review of the Recent Literature,” Dec. 2007.

[2] P. De Bruijn, “the Spatial Industrial Organization of Innovation,” *Business*, 2009.

[3] E. Kerimoglu, “Is Creativity-Based Urban Development Possible in Turkey? An Evaluation of Small Cities on the Aegean Coast,” *Sustain.*, vol. 16, no. 2, 2024, doi: 10.3390/su16020900.

[4] S. Liu, G. Zou, and S. Zhang, “A clustering-based method of typical architectural case mining for architectural innovation,” *J. Asian Archit. Build. Eng.*, vol. 19, no. 2, pp. 71–89, 2020, doi: 10.1080/13467581.2019.1709473.

[5] N. Esmaeilpoorarabi, T. Yigitcanlar, and M. Guaralda, “Place quality in innovation clusters: An empirical analysis of global best practices from Singapore, Helsinki, New York, and Sydney,” *Cities*, vol. 74, pp. 156–168, 2018, doi: 10.1016/j.cities.2017.11.017.

[6] M. Davies, W. P. Carter, Y. El-Ayouty, and K. J. Ford, “Organization for Economic Cooperation and Development, Principles of Corporate Governance,” *Gov. Ethics Law Enforc.*, pp. 289–294, 2024, doi: 10.5040/9798216969938.0013.

[7] J. Alarcón, D. Güemes-Castorena, and M. Flegl, “Comparative Analysis of Innovation Districts to Set Up Performance Goals for Tec Innovation District,” *Qual. Innov. Prosper.*, vol. 27, pp. 158–176, Jul. 2023, doi: 10.12776/QIP.V27I2.1873.

[8] DSIT, “Analytical Report: Identifying and describing UK Innovation clusters,” 2024, [Online]. Available: www.camecon.com

[9] P. Cooke and L. Leydesdorff, “Regional Development in the Knowledge-Based Economy: The Construction of Advantage,” *J. Technol. Transf.*, vol. 31, no. 1, pp. 5–15, 2006, doi: 10.1007/s10961-005-5009-3.

[10] R. Adu-McVie, T. Yigitcanlar, I. Erol, and B. Xia, “Classifying innovation districts: Delphi validation of a multidimensional framework,” *Land use policy*, vol. 111, p. 105779, 2021, doi: https://doi.org/10.1016/j.landusepol.2021.105779.

[11] “https://www.innovationquarter.com/articles/giid-on-global-network-and-innovation-quarter/”, [Online]. Available: https://www.innovationquarter.com/articles/giid-on-global-network-and-innovation-quarter/

[12] T. Nam and T. A. Pardo, “Smart city as urban innovation: Focusing on management, policy, and context,” in *ACM International Conference Proceeding Series*, 2011, pp. 185–194. doi: 10.1145/2072069.2072100.

[13] J. Vleugel, *Clusters and spatial planning - Towards a research program*. 2005.

[14] H. D. Evers, S. Gerke, and T. Menkhoff, “Knowledge clusters and knowledge hubs: Designing epistemic landscapes for development,” *J. Knowl. Manag.*, vol. 14, no. 5, pp. 678–689, 2010, doi: 10.1108/13673271011074836.

[15] R. Florida, “THE Rise of the Creative Class: And How It’s Transforming Work, Leisure, Community, and Everyday Life,” *Can. Public Policy / Anal. Polit.*, vol. 29, Sep. 2003, doi: 10.2307/3552294.

[16] K. Ergazakis, K. Metaxiotis, and J. Psarras, “Towards knowledge cities: conceptual analysis and success stories,” *J. Knowl. Manag.*, vol. 8, no. 5, pp. 5–15, Jan. 2004, doi: 10.1108/13673270410558747.

[17] S. Zhong, “Production, Creative Firms and Urban Space in Shanghai,” *Cult. Unbound*, vol. 4, no. 1 SE-Theme: Shanghai Modern: The Future in Microcosm?, pp. 169–191, Jan. 2011, doi: 10.3384/cu.2000.1525.124169.

[18] R. M. M. Al-Khafaji, “The Urban Capitals: A New Guide for Sustainable and Smart Development,” *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 1094, no. 1, p. 012026, 2021, doi: 10.1088/1757-899x/1094/1/012026.

[19] R. M. M. Al-Kafaji, “Spatial indicators of knowledge strategies applications,” *AIP Conf. Proc.*, vol. 2793, no. 1, p. 30004, Aug. 2023, doi: 10.1063/5.0163241.

[20] D. Arthurs, E. Cassidy, C. H. Davis, and D. Wolfe, “Indicators to support innovation cluster policy,” *Int. J. Technol. Manag.*, vol. 46, no. 3–4, pp. 263–279, 2009, doi: 10.1504/ijtm.2009.023376.

[21] Yuye Zhou, Yukun Li, Yi Wang "Empirical Research on Innovation Cluster Area Planning Based on Collaborative Innovation Theory", Urban and Regional Planning. Vol. 4, No. 4, 2019, pp. 152-161. doi: 10.11648/j.urp.20190404.14.

ARTICLE

JOURNAL`S UNIVERSITY OF BABYLON FOR ENGINEERING SCIENCES (JUBES)

مـــجلـة جـــامعة بـــابـل للعلـــوم الهندسية

Vol. 32, No. 5. \ 2024 ISSN: 2616 - 9916

الإمكانات المكانية لتخطيط تجمعات الابتكار

إعادة تعريف الإمكانات المكانية في مدينة الإسكندرية في العراق

رشا مالك موسى

قسم هندسة العمارة، كلية الهندسة، جامعة بابل، بابل، العراق

Eng.rasha.malik@uobabylon.edu.iq

الخلاصة

ان القدرة التنافسية تعد من السمات الرئيسية التي تؤثر في قرارات التوقيع المكاني للأنشطة الصناعية. ويرتكز الاقتصاد الجديد القائم على الابتكار والمعرفة على الروابط ضمن الفضاء المحفز لعملية نقل المعرفة بأنواعها الملموسة وغير الملموسة للحفاظ على القدرة التنافسية وتعزيز الابتكار. يناقش هذا البحث المحفزات التي يوفرها السياق الحضري لتحفيز عمليات الابتكار في الصناعات. وقد أظهرت العديد من الدراسات أن هناك مستوى من الروابط التي يتم انشائها بين التجمعات القائمة على انشطة الابتكار في مجالات الصناعة والسياقات الحضرية والإقليمية لمواقع تلك الأنشطة. تعاني العديد من التجمعات الصناعية في المدن العراقية من عقبات تعيق عملية التفاعل الايجابي بين النشاط و محيطه الحضري. يهدف البحث إلى دراسة عوامل جودة الموقع وإمكاناته واثرها في تعزيز مناخ العمل في التجمعات الصناعية بما يحفز خلق بيئات جاذبة لعملية الابتكار. ان البحث يقوم على اتباع المنهج التحليلي من خلال مراجعة الأدبيات وتحليل الدراسات التي شملت العلاقة بين مجموعات الابتكار ومؤشرات الجودة في السياق الحضري. ويهدف البحث إلى تقديم اطار عمل يرتكز على السياق الحضري ونظم الابتكار يمكن توظيفه في تقييم السياق الحضري للاندماج مع أنواع معينة من مجموعات الابتكار. الفرضية هي أن النموذج القائم على اطار متكامل من مؤشرات السياق الحضري ونظام الابتكار يمكنه أن يوفر موجهاً للسياسة المكانية لتوزيع الانشطة الصناعية. وتتضمن منهجية البحث وضع المصطلحات والتعريفات للمفردات الاساسية البحث، وبناء إطار عمل (إطار نموذج الابتكار المكاني) الذي يتضمن مؤشرات التخطيط المكاني وفقا لمتطلبات عملية الابتكار في مجال النشاط الصناعي.

كما يتكامل منهج البحث من خلال تطبيق النموذج البحثي في دراسة الحالة المحلية وفي تحديد وتصنيف المؤشرات الفعالة و الخصائص الأساسية لجودة الموقع لإنشاء أو تعزيز مجموعات الابتكار في مدينة الإسكندرية في العراق وتم التوصل الى ان النموذج المقترح يوفر رؤيةً متكاملةً بين الابعاد الملوسة وغير الملموسة التي تشمل النشاط الصناعي والسياق الحضري للموقع والتي تسهم في تحديد السياسات الملائمة للتدخل في المدن وفقا لجوانب ومستويات التكامل.

الكلمات الدالة: التكتل، الابتكار، الإمكانات المكانية، جودة المكان.