



Future Cities within the Context of the Knowledge-Based Economy: Innovative Strategies and Policies – The Case Study of Amman

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Abstract

Objectives: This paper presents a planning framework for establishing a Knowledge City, clarifying its dimensions and strategic requirements, and explaining how the knowledge economy reshapes urban development.

Methodology: Qualitative, descriptive–analytical design with a comparative lens. Three stages: (1) critical review of academic literature and strategic reports (2015–2024); (2) case study of Amman, selected for its regional role and ongoing digital transition; and (3) SWOT analysis and benchmarking against leading Knowledge Cities (Singapore, Barcelona, Seoul) across domains including digital infrastructure, innovation policies, human capital, and academia–industry collaboration.

Findings: Urban environments must be reconfigured to meet the dynamics of the knowledge economy. Effective Knowledge Cities exhibit functional flexibility, spatial intelligence, and integrated innovation ecosystems. Planning that prioritizes functional connectivity and spatial synergy outperforms traditional zoning. Land-use strategies should advance digital inclusion, knowledge mobility, and real-time adaptability in service provision.

Implications: The framework guides theory, practice, and policy by identifying institutional, legislative, and technological levers: empowering research hubs, reforming education systems, incentivizing public–private partnerships, and adopting adaptive, data-driven governance. It advances scholarly understanding by operationalizing the Knowledge City as a systems-based, networked urban model linking economy, space, and innovation.

Conclusions: Synthesizing global benchmarks with the Amman case, the study articulates an actionable pathway for transforming conventional cities into Knowledge Cities. The proposed framework supports creativity, economic competitiveness, and social well-being, offering transferable guidelines for cities pursuing knowledge-driven development.

Key words

Digital urbanism, Innovation ecosystems, Knowledge City, Smart urban policies, Spatial intelligence.

Introduction

The rapid pace of globalization and technological innovation has propelled the concept of future cities to the forefront of urban development discourse. In the context of a knowledge-based economy, future cities are envisioned as dynamic, resilient, and culturally vibrant urban environments (Vaz, 2024). These cities leverage knowledge creation, dissemination, and application as primary drivers of economic growth and enhanced quality of life (Mohamed et al., 2021). Amman, the capital of Jordan, serves as a compelling case study for exploring this transition, given its rich history, strategic location, and aspirations to emerge as a leading Knowledge City in the Middle East (Bataineh, 2022). The city has undergone significant evolution, particularly following its designation as the capital of Transjordan in 1921 (Bataineh, 2022). Nestled on rolling hills at the eastern boundary of the Ajloun Mountains, Amman boasts numerous historical sites, including the Roman amphitheater and the Amman Citadel, which reflect its rich cultural heritage (Hamdan & Di Raimo, 2024).

Despite extensive research on theories and operations related to knowledge economies, there is a notable lack of initiatives assessing the geographical implications of the knowledge economy within the context of Amman's urban landscape. Furthermore, a significant gap remains in translating theoretical concepts into practical urban planning strategies. Traditional urban planning models, typically focused on industrial zones and resource connectivity, may not adequately address the multifaceted requirements of a knowledge-based urban environment. Thus, the existing city has been planned according to strategic agents that adhere to basic, traditional economic notions, requiring natural resources and their connectivity to production and distribution sites. Consequently, urban planning is categorized into zoning requirements, including industrial zones, green/open spaces,

recreational areas, commercial zones, and residential zones. This study will cite existing urban planning concepts, but these do not align with the needs of future cities founded on a knowledge economy.

In Knowledge Cities, activities related to information and knowledge creation occur within a framework of urbanization and secondary developments, closely linked to the sociocultural dynamics of urban life. Therefore, a comprehensive assessment of innovative strategies and policies is essential to guide Amman's evolution into a sustainable and competitive Knowledge City.

Statement of the problem and research questions

This study addresses the challenge of developing a comprehensive framework for integrating creative city attributes into urban planning in Amman. The central research questions are as follows:

1. What key components and strategies are essential for Amman's successful transition into a Knowledge City, considering its unique socio-economic and cultural context?
2. How can cultural vibrancy, the creative economy, and an enabling environment be effectively fostered and measured to contribute to Amman's economic output and overall urban development?

Objective of the study

The primary objectives of this study are:

1. To identify and analyze the critical components that define a Knowledge City, with a specific focus on their applicability and relevance to Amman.
2. To assess the current state of cultural vibrancy, the creative economy, and the enabling environment in Amman, identifying strengths, weaknesses, opportunities, and threats (SWOT analysis).

3. To develop a set of tailored indicators for measuring the progress of Amman's transformation into a Knowledge City.

4. To provide actionable recommendations for policymakers and urban planners to enhance strategic planning and promote sustainable urban development in Amman.

The importance of studying

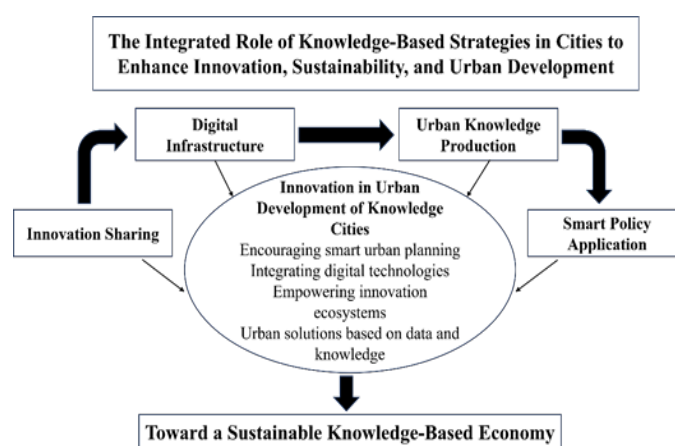
This research aims to conduct a planning assessment of what constitutes a Knowledge City and evaluate its components and requirements for an effective strategic plan. While the existing urban landscape has been designed around traditional economic frameworks (Mohamed et al., 2021), emphasizing the necessity of natural resources and their connectivity to production and distribution sites (Abu-Anzeh et al., 2022). Consequently, urban planning is categorized into various zoning requirements, including industrial, commercial, residential, and recreational spaces (Alnusairat et al., 2022). While existing urban planning concepts have value, they do not adequately align with the needs of future cities grounded in a knowledge economy. In Knowledge Cities, activities related to information and knowledge creation occur within a framework of urbanization and secondary development, closely linked to the sociocultural dynamics of urban life (Homsombat et al., 2025).

Therefore, this research calls for a reassessment of the strategic plans that cities aspiring to become Knowledge Cities rely upon. These plans should be rooted in a prosperous knowledge economy characterized by the generation, dissemination, and application of knowledge. Furthermore, strategic plans must incorporate elements of sustainable growth, social equity, and opportunities for economic development. Key components such as Knowledge Zones, networks, and information and telecommunication technolo-

gies (ICT) play a vital role in facilitating knowledge generation and access, mediating sustainable development, and fostering innovation as illustrated in Figure 1. These support the facilitation of knowledge generation and access, mediating Sustainable Development, Future Orientation, and Innovation Ecology. The transmission of knowledge from creators to locations, where it can be transformed into transformation-oriented elements, is a vital central tenet of these strategic plans, along with concepts of Knowledge commerce and governance (Amidon, 2003).

This research also assesses international experiences of cities that have successfully transitioned into knowledge Cities, such as Singapore, Barcelona, Melbourne, Boston, and Montreal, from which valuable lessons can be drawn. Ultimately, this research culminates in a case study of Amman, denoting its potential and promise to evolve into Knowledge City.

Figure (1): The composite role of knowledge-based strategies for improving innovations, sustainable development, and appropriate urbanization goals as an applied model for Amman.



Literature Review

Cities have evolved to facilitate human interaction, shaping the concept of urban spaces as interconnected metropolitan areas where essential services and amenities are within walking distance (Carmona, 2021). The expansion of cities has historically been influenced by industrialization and advancements in

transportation and communication technologies (He & Bhatti, 2025). These developments have created new methods of exploration and interaction, allowing for greater connectivity both within urban environments and globally, therefore, creating interactions and relationships that bridged distance and time (Tiwari, 2017). These methods included personal vehicles, subways, and the telephone (He & Bhatti, 2025). Furthermore, later, through the growth of information and communication technologies, the communication and interaction barriers expanded from those living in a city to the entire world, where everyone could generate their own world/city (Florido-Benítez, 2024).

Considering all the implications of these developments in the city and the awareness of the contemporary city, the city still plays a critical role (Kong et al., 2025). This role involves provisioned roles that require people to interact actively and intimately. In other words, urban planning remains essential in the context of a knowledge economy, where the integration of ICT enhances development (Chen & Li, 2023). These technologies provide new economic tools, create employment opportunities, attract investments, and improve governmental productivity (Alshuwaikhat et al., 2022). The establishment of future cities rooted in knowledge economies relies on a combination of knowledge and experiential engagement with community institutions (Saba et al., 2023).

Effective knowledge-based urban development necessitates that institutions adapt their practices to leverage knowledge as a primary resource. (Kong et al., 2025). Information technology significantly transforms human cognition and behaviour, influencing social, economic, and educational dimensions. It reshapes labour markets, creating new professions that require continuous training and lifelong learning (Mohamed et al., 2021).

Since the 1990s, governments have increasingly recognized organizations that contribute to knowledge acquisition and application (Knight, 1995). The focus has shifted towards enhancing productivity through the optimal use of internal and external knowledge resources (Knight, 1995). Research indicates that successful cities in the knowledge economy, such as those studied by Nour (2015), demonstrate the importance of integrating knowledge development into urban planning frameworks. As cities continue to adapt to the challenges of the knowledge economy, effective urban planning must prioritize the integration of ICT and foster environments conducive to knowledge creation and exchange. This approach is essential for the sustainable development of cities like Amman, which aspires to become a leading Knowledge City in the region.

Methodology

This research investigates the economic and urban knowledge structure of Amman by employing a comprehensive methodological framework. The study uses SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) to assess the current knowledge landscape and identify potential avenues for enhancement as well as obstacles that may impede progress. The methodology is structured based on four key components:

1. Definition of the Knowledge-Based Economy

The first component involves a precise definition of the knowledge-based economy and its four foundational pillars: economic stimulation, education, innovation, and information and communication infrastructure. Additionally, this section includes an overview of global indicators established by the World Bank and the World Intellectual Property Organization (WIPO). These indicators serve as benchmarks for evaluating Amman's progress within the knowledge economy.

2. Framework for Knowledge Cities

The second component focuses on defining the concept of a knowledge/information city and society. This involves the establishment of relevant policies, strategies, and planning standards that facilitate urban and functional development. By outlining the necessary frameworks, this section aims to provide a clear pathway for transitioning Amman into a Knowledge City.

3. Review of International and Regional Practices

The third component entails a comprehensive review of international and regional case studies. The objective is to analyse established knowledge cities such as Singapore, Barcelona, Melbourne, Boston, and Montreal, assessing their practices and strategies for applicability to Amman's context. To support this analysis, the study utilizes the Innovation Index from the Global Knowledge Index report published by the United Nations Development Programme (UNDP) in 2020. This analysis provides insights into the successes and challenges faced by these cities in their pursuit of becoming Knowledge Cities.

4. Current Situation Analysis and Roadmap Development

The final component involves an in-depth analysis of Amman's current situation regarding its knowledge economy. This analysis aims to formulate a proposed roadmap tailored to national needs, leveraging best practices from other countries. The roadmap will include recommendations for specific projects focused on critical areas such as education, innovation, legislation, and building regulations. By identifying strategic initiatives, this research seeks to create a foundational framework for Amman's transition into a Knowledge City.

Knowledge Society and Indicators

A knowledge society is one that heavily relies on

information and knowledge across various dimensions of life, including economic, social, cultural, and political aspects (Stehr, 2018). In this context, the knowledge economy serves as the foundation, shaping the society's identity, image, and philosophical outlook.

Knowledge and information are vital assets for any society that possesses them, characterized by their ability to proliferate and transfer rapidly. Although measuring the intrinsic value of knowledge poses challenges, its worth is often determined by the innovations it generates and the creative thought underpinning these innovations (Stehr, 2018). Key features of a knowledge society include:

1. Economically active entities leverage knowledge as a primary resource, enhancing their performance and competitive capabilities while fostering innovation.
2. The intensive use of information and knowledge by the public empowers individuals to enhance their activities, understand their rights, and fulfil their responsibilities.
3. To enable stakeholders to fulfil their roles effectively, it is essential to provide the necessary infrastructure for a knowledge society, develop specific knowledge and information skills, and facilitate their smooth dissemination.

Indicators for evaluating and classifying a knowledge society include the reduction of illiteracy, ignorance, and backwardness. Such a society relies on science and knowledge as foundational pillars, where knowledgeable individuals play a crucial role in its advancement and prosperity. Furthermore, a knowledge society actively contributes to the use, production, and development of knowledge, ensuring that

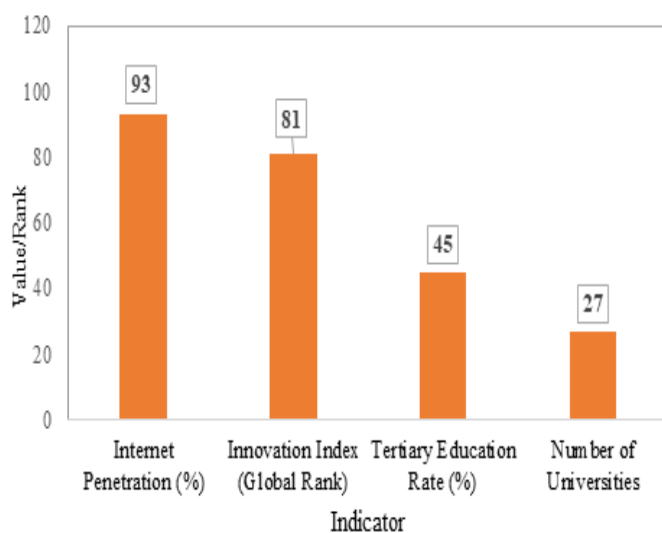
information flows seamlessly and without barriers.

Equally important, knowledge should be accessible to all individuals without discrimination. This accessibility is facilitated through computer technologies and modern communication systems, which enhance business operations and knowledge functions. The ultimate aim is to create a society capable of competing globally in knowledge production and dissemination.

Quantitative Indicators for Amman: Knowledge Economy Context

To assess Amman's potential as a knowledge-based city, Figure 2 presents key quantitative indicators that reflect its progress in this area. These indicators include the global innovation ranking, internet penetration rates, tertiary education levels, and the number of higher education institutions.

Figure (2): Summarizes the indicators that are crucial for understanding Amman's shift towards becoming a knowledge-driven society. These metrics provide insight into the city's readiness to compete in the global knowledge economy.



Knowledge Economy and its Key Pillars

The 21st century is an economy transforming into economic activities based on a knowledge process (Bogoviz et al., 2018). Economic activities that relied upon an industrialized situation have been greatly diminished since the end of the twentieth century

(Bogoviz et al., 2018). This is known as a “post-industrial economy.” For example, the 20th century relied upon a tangible process dependent upon land, capital, factories, etc (Carrillo, 2015). This transition emphasizes intangible assets such as patents, innovations, culture, values, human talent, and technical expertise, highlighting knowledge as a crucial resource for competitive advantage and sustainable growth (Ionita & Dinu, 2021). Investment in knowledge is pivotal for global economic growth. The emerging economic framework prioritizes the flow of knowledge over mere technological solutions, focusing on creativity, innovation, stakeholder success, and international cooperation. In this context, human development is defined not by ownership but by the capacity to contribute positively to society.

The trigger for the emergence of a knowledge economy was the development and improvement of knowledge-based services and supplementary technology (Chen & Li, 2023). Major global cities like Paris, London, New York, and Tokyo are actively enhancing their competitive edge by attracting skilled professionals in specialized knowledge sectors, driven by rapid technological progress in communication (Sassen, 2013). To effectively transition to a knowledge economy, a robust educational foundation is essential. Schools and higher education institutions must facilitate the acquisition, retention, and creation of knowledge, serving as the backbone of societal progress.

According to the World Bank, a knowledge economy efficiently generates, acquires, and capitalizes on knowledge, supported by four key pillars: Economic Incentives, Education, Innovation, and Information and Communications. These pillars enable both economic and social development (Katuščáková et al., 2023). Currently, knowledge is recognized as a vital factor in production and economic growth. The

emphasis on information and technology has transformed them into fundamental elements of economic development. Investment in information technology enhances productivity and creates new job opportunities. To cultivate a successful knowledge economy, several factors are critical, according to the Global Knowledge Index (2020):

1. **Institutional Framework:** A supportive regulatory environment that encourages technological advancement and investment in science and innovation.

2. **Human Capital:** An educated workforce capable of creating, maintaining, and disseminating knowledge, tailored to the societal context and global demands.

3. **Innovation Ecosystem:** A robust education system that fosters creativity and utilizes local and international knowledge resources to develop advanced products and technologies.

4. **Knowledge Infrastructure:** Investment in information and communication technology to enhance educational quality and support innovation.

Achieving a knowledge economy requires strategic public expenditure that prioritizes education from primary to higher levels, alongside a commitment to developing high-quality human capital and fostering an environment conducive to knowledge creation.

Advantages and Constituents of the Knowledge Economy

The knowledge economy is characterized by several features that distinguish it from traditional economies (Carrillo, 2015). Firstly, knowledge serves as the primary driver of production and acts as an economic commodity (Mohamed et al., 2021). Unlike physical goods, knowledge is not depleted through use; in-

stead, its value increases as it is utilized. These characteristics position the knowledge economy as one based on abundance rather than scarcity. Additionally, once knowledge is created, it becomes a shared resource, accessible to all, much like light, which is weightless and easily disseminated. The constituents of the knowledge economy can be summarized in Table (1).

Table (1): Key constituents of the knowledge economy.

Description	Constituent
Knowledge Society	A society where knowledge is widely available and not restricted to specialists.
Education	Essential for developing individuals capable of independent thought and creativity.
Research and Development	Strong support needed to generate knowledge beneficial to society.
Legal Framework	Systems that encourage and protect creativity and innovation.
Communication Networks	Effective links between research centres and creative industries.
Industry Collaboration	Industries partnering in the creation and innovation process.
University-Community Engagement	Universities involved in local development and knowledge sharing.

The effective integration of these elements is crucial for fostering a successful knowledge economy. Public policies and investment in education play a pivotal role in ensuring that individuals are equipped with the necessary knowledge and skills. Furthermore, robust support for research and development is essential for generating the knowledge that drives societal progress.

Concept and Aspects of Knowledge Cities

A knowledge city is defined as a city that possesses a robust economy driven by scientific research and technological development. Its primary objective is to harness these capabilities to produce goods and services, thereby increasing the added value in the economy and enhancing the overall welfare of society (Sancar & Cavus, 2025).

Edvinsson defines a knowledge city as one designed to foster knowledge education among its residents, establishing values that enhance knowledge across various sectors, including cultural, economic, and social development (Edvinsson, 2006). Sivan and Rosen describe it as having a knowledge infrastructure composed of three elements: knowledge users, knowledge services, and the knowledge keyboard that connects them (Sivan, 2000). Coasts refers to the knowledge city as an "Ideopolis," characterized by (Méndez & Moral, 2011):

1. High levels of economic development and success.
2. Intensive knowledge generation.
3. A diverse industrial base excelling in multiple fields.
4. Collaboration with universities to establish industries based on scientific research.
5. A robust communication infrastructure connecting the city internally and with the global community.
6. Identification and Promotion of Knowledge Investment Opportunities.
7. Development strategies focused on knowledge for regional advancement.

Knowledge cities also prioritize culture, electronic development, and transportation networks. They invest significantly in education, training, research, and development, embodying an information society where ideas flourish. Knowledge serves as the primary driving force, adding substantial value to the economic base. Friedman describes knowledge cities as pivotal in the global economic system, facilitating spatial interconnections and establishing new dimensions for urban development (Friedmann, 2002).

The main role of the knowledge city is to attract creative, competent people and research centres. The real knowledge city is not only rich in various types

of modern networks that are based on the natural concentration of research and development activities, but also rich in the number and types of organizations and institutions that have established roots in the city, as well as a highly efficient knowledge workforce and mechanisms of their relationships with each other. The knowledge city must also provide an attractive urban environment of high quality so that creators can stay, live, learn, and work in it. In the knowledge city, there must be a group of competent and creative people supported by a number of qualified individuals aspiring to be creative. This environment nurtures a "creative class" comprising professionals in information technology, architecture, sciences, culture, art, healthcare, finance, and more.

Knowledge Cities focus on several crucial axes, including:

1. Economy: Indicators such as growth in high-tech sectors, knowledge production, workforce percentages in advanced fields, and GDP growth rates.
2. Creativity: Measured through patents, establishment of high-tech facilities, and access to venture capital.
3. Human Capital: Evaluated by the number of university graduates, population growth, and immigrant qualifications.
4. Culture: The cultural axis emphasizes ethnic diversity and openness to cultural variations within the city's population.

Overall, knowledge cities cultivate an ecosystem that integrates economic development, creativity, human capital, and cultural diversity, positioning themselves as leaders in the knowledge economy.

Planning of the Knowledge City and Its Patterns

Knowledge cities are distinct from modern or traditional cities due to their structural emphasis on knowledge areas and clusters, which serve as founda-

tional pillars. These cities aim to create an urban environment that fosters innovation and development, positioning knowledge as a key driver of economic growth.

The primary goal of planning a knowledge city is to establish a robust urban center that supports and enhances surrounding population clusters. With rapid technological advancements in information and communication technology, knowledge cities experience significant material and non-material flows, including people, goods, information, services, ideas, capital, and labor. This evolution presents new challenges regarding urban boundaries and the organization of urban planning.

To address these challenges, knowledge cities must implement a comprehensive set of policies and programs that consider social and urban dynamics. Key areas for these policies include:

1. Urban Land Use Planning: Ensuring the distribution of urban activities aligns with the knowledge objectives of the city.
2. Cultural Strategies: Adopting multiple strategies that reflect the ethnic and cultural diversity of the population.
3. Urban Governance: Encouraging collaborative planning between residents, institutions, universities, and research centers, fostering innovation and knowledge exchange.
4. Support for Creative Institutions: Promoting arts agencies, cultural associations, and environmental organizations to enrich the city's cultural landscape.

Information and communication technologies are vital for coordinating various city components and enhancing the flow of knowledge and resources through integrated networks. These technologies facilitate efficient interactions among residents, institutions, and businesses. Moreover, small and medium enterprise

development strategies support the knowledge economy by providing job opportunities and stimulating innovation. Finally, information and communication technologies should have a pivotal role in supporting coordination between various components of the city and enhancing knowledge and material flows through integrated networks. It is possible to distinguish between several patterns/forms of knowledge cities according to the level of development and technical and knowledge progress.

Electronic City

The city communicates with citizens and institutions via the Internet and electronic communication, with the latter being the primary means of interaction through which various city departments and facilities perform their tasks (Maziashvili et al., 2023).

Components of an Electronic City

1. Strong Communication Infrastructure: Essential for seamless connectivity.
2. Informational Components: Systems that provide relevant data and services.
3. Human Components: Skilled personnel to manage and operate systems.
4. Legislative Components: Legal frameworks that support electronic transactions.

Transaction Stages

Transactions within an electronic city occur in four stages:

1. Information is made available on the city's website.
2. Mutual communication is established between agencies, institutions, and individuals.
3. Engaging directly with citizens for service delivery.
4. Implementation of systems for service and data exchange.

Core Components

The essential components of the electronic city include:

1. The geographical area.
2. The citizen who uses information technology.
3. The infrastructure.

Global (Comprehensive) New City

For a knowledge city to find a suitable position for itself in the fields of new knowledge and at the intersections of new patterns of economic development (biosciences, information, and communication technologies), it must build on its distinctive characteristics. The primary goal is to attract and retain a skilled workforce in the fields of knowledge. The city must also work to encourage the exchange and dissemination of knowledge. Additionally, it must provide the appropriate climate for creativity and innovation.

Key Elements of the Twenty-First Century City

The identity of a modern city is shaped by its local culture, which includes:

1. Vitality: The dynamic nature of city life.
2. Authenticity: The unique characteristics that define the city.
3. Ethnic Diversity: A mix of cultures enriches the social fabric.
4. Social Contrast and Lifestyle: Varied lifestyles contribute to the city's vibrancy.

A strong connection between the arts, culture, and scientific knowledge is essential for fostering creativity.

Strategic Development

A global city must develop comprehensive strategies that ensure:

1. Advanced Electronic Infrastructure: To enhance its competitive position.

2. Global Communication Networks: Connecting with other comprehensive cities worldwide.

3. Attracting Major Companies: Creating a conducive environment for global headquarters and high-level financial institutions.

Additionally, the city should focus on building a new type of community by addressing its residents' needs and fostering strong relationships among individuals and groups.

New Concepts for Network Cities

Global (comprehensive) city networks are increasingly shaped by the rapid development of information infrastructure, both within urban areas and between them (Taylor & Derudder, 2015). The activities and functions in network cities rely heavily on advanced communication technologies that facilitate complex interactions within and between cities. With regard to planning and designing network cities, it must be taken into consideration that information and communications are not considered important characteristics only as illustrative examples of the flexibility of urban space and thus the openness of the city, but because they tend to reshape its space and activities in an entirely new way (Taylor & Derudder, 2015).

In a network society dominated by real-time information flows, the significance of physical distance diminishes. Therefore, the effectiveness of network links, mobility, and spatial policies becomes paramount. Traditional spatial planning principles, such as "Location Theory" and "Compact City," may not adequately address these developments, necessitating a new conceptual framework for network cities. The new concept must view the city as an open, dynamic system. Human interactions and urban activities extend beyond traditional boundaries, requiring integration of mobility considerations into urban planning. Concepts like "network cities," "urban networks," and

“corridors” exemplify this approach. For instance, the “Corridor” concept promotes planned urban development along key transportation axes, fostering functional diversity and interconnectivity among urban centers. Urban planning strategies should recognize transitional environments as new internal centers of network cities, moving away from the traditional urban center model. This innovative perspective could significantly impact urban development in a mobile society.

The new strategies for urban planning and design that take into account transitional environments should consider these environments as the new internal centers of the network city instead of the traditional city center or urban center. Such a pioneering concept may be effective in influencing the development of place in an increasingly mobile society. Another concept that can be used in the process of planning an urban place is the concept of action space, which is the place where people can practice their activities. As has been discussed, designing the knowledge city’s form and the urban area’s structure requires the designer to have conceptual insight. This theory serves as a foundation for defining contemporary spatial organization models and examining the emerging network components of the four most prominent types of networked mobility spaces in the modern knowledge-based city.

These types include knowledge-based communities, universities, scientific and technical parks, e-commerce places, passenger airports and high-speed train stations, free trade zones, free internet zones, and multi-form enclosed areas designated for shipping goods.

Knowledge Innovation Zones and Clusters

Both knowledge and innovation are at the heart of the concept of the knowledge city. Thus, such a city is characterized by the flow of information between

the overlapping networks of knowledge innovation zones. The knowledge innovation zone is defined as the urban place or geographical region in which products, services, or parts of industries are produced, in which a community with expertise lives, and in which knowledge flows from the point of origin to the point where there is a need or opportunity for that knowledge (Amidon, 2003).

Key indicators of knowledge innovation zones include (Jaafari, A., & Mehrara, 2021):

1. Human Capital: High education levels and a concentration of talented individuals and experts.
2. Intellectual Capital: Values, patents, and cultural diversity that enhance innovation.
3. Infrastructure: Knowledge-rich locations supported by resources and expertise networks.
4. Educational Networks: Libraries, universities, research laboratories, and think tanks.
5. Social Capital: A shared culture that values creativity and knowledge.

Consequently, the intellectual innovation zone adopts the idea of a service-based society, such as in the case of Silicon Valley in the United States (Fasnacht, 2018). The vision for developing the knowledge innovation zone should be based on making it a city for creative adventures, thereby creating a new technical-urban identity. To achieve this goal, the city needs to develop a high-tech infrastructure and establish a specialized Cyberport to keep pace with the information revolution.

Innovation Hubs (E-commerce and Free Trade Zones)

E-commerce hubs are vital components of the knowledge city, emerging from the rapid growth of internet connectivity and electronic commercial transactions (Wang et al., 2023). These zones facilitate retail trade through digital platforms, with a sig-

nificant portion of global commerce conducted online. By 2010, approximately one-third of the world's commercial transactions, totaling around \$60 trillion, were executed through online channels (Turban et al., 2018).

Higher Education Institutions

Universities play a crucial role in addressing urban challenges in the knowledge economy (Sassen, 2013). They, along with research and development centers and scientific parks, form a vital cluster of knowledge innovations essential for enhancing a city's competitiveness. Key contributions of universities include:

1. Providing Scientific Competencies: Graduates are equipped with relevant knowledge and skills.
2. Education and Training: Opportunities for workers to advance in knowledge-based fields.
3. Attracting Knowledge-Based Businesses: Creating an environment conducive to innovation and entrepreneurship.

Examples of Successful Knowledge Cities

Some cities worldwide have succeeded in being role models in knowledge cities. Most prominently, these include Singapore (Roy & Ong, 2011), Boston city in the United States of America (Taylor & Lang, 2005), and Barcelona city in Spain (Stock, 2011). There are also other cities striving to become knowledge cities. These cities have adopted strategic plans to achieve this goal. These include Montreal City in Canada (Stock, 2011) and Melbourne City in Australia (Tuli et al., 2019). Some Arab cities are also pursuing this path, such as Jubail City in the Kingdom of Saudi Arabia (Alarabi & Alasmari, 2023) and Dubai City in the United Arab Emirates (El Hendy et al., 2022).

Singapore is a leading example, with a population of about four million, where 90% of residents have

Internet access. The city boasts a high standard of living and advanced technology, surpassing many developed nations (Pereira et al., 2023). Ranked first in global competitiveness by the World Economic Forum, Singapore has invested heavily in human capital, particularly in education and training (Pereira et al., 2023), while also fostering a vibrant cultural scene with landmarks like the Opera House and the "Esplanade" (Li, 2017).

Boston has established itself as a center for biotechnology, medical sciences, and information technology (Darmody & Bendis, 2021). While Oxford was famous in education, engineering, and publishing (Manley & Whyman, 2021), Boston established its presence in multiple fields such as science, technology, education, and professional services, making it one of the global centers of knowledge (Darmody & Bendis, 2021).

In Spain, Barcelona City successfully transitioned to the knowledge era by expanding the scope of knowledge and creating a network of advanced public libraries equipped with modern communication technologies (Stock, 2011). The city also succeeded in integrating its residents from different cultures and nationalities and created a high-level cultural strategy that connects all the city's facilities and cultural services. In addition, it designed its streets and neighbourhoods to serve culture and allow residents to express themselves freely.

Montreal is actively enhancing its knowledge activities by focusing on human capital and attracting highly qualified immigrants (Stock, 2011). However, it has not achieved the rapid growth that some other cities have reached, such as Calgary in Canada (Gazerani & Frigon, 2024). Montreal seeks to enhance its position as a knowledge city by improving the quality of its educational institutions, which will

help attract more global competencies.

Melbourne has adopted the “Melbourne 2010” vision, emphasizing economic power, social justice, and environmental sustainability (Tuli et al., 2019). The city is developing its technical infrastructure and fostering knowledge partnerships across sectors, utilizing smart technologies to enhance the urban environment and attract investment.

In the Kingdom of Saudi Arabia, Jubail Industrial City has set a strategy for its transformation into an information society that relies on communications and information technologies (Alarabi & Alasmari, 2023). This strategy aims to increase efficiency and productivity by improving the communications infrastructure and developing an appropriate environment for embracing and employing knowledge effectively. The city also seeks to enhance partnerships with the private sector in the field of information and the digital content industry.

Dubai City in the United Arab Emirates has set a strategy to achieve the concept of e-government and attract companies working in information and communication technology (El Hendy et al., 2022). The city aims to build an advanced infrastructure that aligns with global standards and provides an environment that encourages innovation and growth in the new internet-based economy sector. In the second phase of its plan, the city includes projects such as establishing a scientific and technical park and a research center in the field of technology and information industry.

These cities aim to leverage knowledge and innovation to strengthen their economic and cultural standing, making knowledge a pivotal driver for sustainable development and growth.

Amman as a Case Study: Current Situation and

Future Proposals

Amman City as a Knowledge and Competitive Urban Center

Amman is increasingly recognized as a global city, integrating with the global knowledge economy through its vibrant urban environment. This includes a continuous flow of individuals, goods, and ideas, supported by advanced infrastructure. The city aims to enhance its position through public-private partnerships and sustainable urban projects.

Knowledge Economy and Strategic Planning

Amman promotes knowledge through its academic institutions, research centers, and scientific parks. With over 85,000 graduates entering the labor market annually, the city’s commercial areas and office complexes bolster the business sector, fostering a competitive investment climate.

Economic and Technical Development

To attract investments, Amman has established advanced industrial zones and free trade centers, backed by robust telecommunications and logistics infrastructure. The expansion of the internet has connected 95% of households, positioning Amman as a regional digital hub.

Openness and Competitiveness

The city enhances its competitiveness by improving living standards, developing human capital, and fostering innovation. Its strategic location supports its role as a regional transportation and commercial center. Through policies of openness and continuous infrastructure modernization, Amman integrates into the global economy, ensuring sustainable growth as a knowledge urban hub.

The research suggests the following for the city of Amman:

1. Facilitate participation in knowledge partnerships by expanding public libraries and educational facilities, enabling the development of a knowledge advancement plan at the city level.

2. Developing a strategy for establishing a knowledge city is a step taken by governments and decision-makers to prioritize the process of establishing the knowledge city. Then, all necessary measures are taken to complete this matter, including issuing the necessary legislation.

3. Developing an executive plan for the knowledge city in accordance with the requirements of information and communication technology. This requires planners who are knowledgeable about the integration of urbanization and information and communication technology, as well as how to cooperate with other bodies to complete the plan. This cooperation aims to achieve full benefit from infrastructure facilities, networks, and information transfer networks.

4. Establishing the electronic infrastructure and networks necessary for the city by contracting with specialized companies and providing all necessary facilities for those companies will enable them to continue developing those facilities and networks and conduct maintenance and improvement operations.

5. We are beginning to convert all uses into information that can be easily circulated through networks and infrastructure facilities. This comes through informatics (educational and commercial) to form electronic knowledge centers.

6. Preparing all environments and residential and non-residential neighborhoods in the city to interact with the requirements of the knowledge city, working on designing smart buildings capable of communicating with each other, forming a knowledge partnership,

and designing Threshold Connections in residential and non-residential neighborhoods and architectural and urban environments in a way that enables them to adapt to the characteristics of the new knowledge environment.

7. Establishing the rules of e-government and electronic management for knowledge management involves converting government transactions, laws, and regulations into the concept of e-government, thereby preserving privacy and facilitating citizens' transactions.

Table (2): SWOT analysis for Amman.

Strengths	Weaknesses	Opportunities	Threats
Presence of reputable universities and research centers	Weak digital infrastructure in certain areas	Potential to develop a digital innovation zone within the capital	Economic pressures and unemployment
Strategic geographical location in the Middle East	Limited investment in research and development	Enhancing partnerships between universities and the private sector	Dependence on foreign aid
High education levels among youth	Brain drain and talent emigration	International support for transitioning to smart and sustainable cities	Regional political instability
Government efforts in digital transformation and knowledge economy	Bureaucracy in implementing national strategies	Learning from successful global models such as Singapore and Barcelona	Digital divide across social groups

Table (2) categorizes key factors affecting Amman's strategic position. It outlines the city's internal strengths and weaknesses, alongside external opportunities and threats, providing a comprehensive overview essential for strategic planning and decision-making.

Comparison with Global Knowledge Cities

As illustrated in Table 3, a comparison of Amman with other global Knowledge Cities highlights the differences in their innovation ecosystems, digital infrastructure, knowledge-based policies, university-industry linkages, and smart city projects.

Table (3): Comparison of Amman with Global Knowledge Cities.

City	Innovation Ecosystem	Digital Infrastructure	Knowledge-based Policies	University-Industry Linkages	Smart City Projects
Amman	Emerging, limited by funding and talent retention	Improving, but still uneven across regions	Present in strategy documents, but weak in execution	Limited and mostly informal	Early-stage initiatives like smart traffic and e-services
Singapore	Highly developed with strong global innovation rank	World-class, with nationwide 5G and smart services	Embedded in national development policies	Strong, supported by government R&D funding	Fully implemented Smart Nation initiative
Barcelona	Strong with focus on creative industries and startups	Advanced, integrated with urban mobility and services	Well-established through EU and local frameworks	Active through innovation hubs and tech parks	Smart Barcelona: IoT, energy, governance
Seoul	Robust, supported by tech giants and government	Extensive digital networks and AI integration	Central to national innovation and economic plans	Institutionalized partnerships in key sectors	Smart Seoul: urban AI, citizen participation platforms

The comparison indicates that Amman has made some progress in developing its urban infrastructure and smart city initiatives. However, it falls short when compared to established knowledge cities like Seoul and Singapore. While Amman exhibits some growth, it lacks a robust, innovative ecosystem and effective institutional governance for knowledge management. Unlike Seoul and Singapore, where regulatory frameworks and institutional support for research and development are well-established, Amman struggles with limited university-industry connectivity and informal collaborations.

This lack of governmental support can hinder innovation, as informal partnerships often lack the stability and resources necessary for sustained development. Furthermore, while local knowledge clusters can aid Amman's aspirations to become a competitive knowledge city, they are not yet strong enough to position it effectively within the regional knowledge landscape.

Amman's reliance on information and communication technologies for data collection and processing is crucial. This approach supports innovation, enhances educational quality, and provides essential knowledge for economic growth. By integrating these pillars, Amman can build a strong foundation for a knowledge-based economy, capable of adapting to modern demands and promoting sustainable development.

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