Al-Balqa Journal for Research and Studies البلقاء للبحوث والدراسات

Volume 25 | Issue 2 Article 6

2022

Evaluating the Role of Universities as Knowledge Hubs: Jordan University of Science and Technology as a Case Study

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AJRS
https://albalqajournal.ammanu.edu.jo/
المجلد (25) العدد (2) 2022

مجلة البلقاء
للبحوث والدراسات

تاريخ الاستلام: 13/1/2022
تاريخ القبول: 15/6/2022
تاريخ النشر: 12/12/2022
10.35875/1105-025-002-006

تقييم دور الجامعات كمحاور معرفة: جامعة العلوم والتكنولوجيا الأردنية ـ حالة دراسية

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الملخص

لا يختلف اثنان على الدور الرئيس للجامعات في التنمية الاقتصادية والاجتماعية والعمرانية. وهذا ما حدا بكثير من الباحثين لتركيز اهتمامهم على الدور الذي يمكن للجامعة أن تؤديه باعتبارها محوراً معرفياً.

وتسعى هذه الدراسة إلى تقييم الدور الذي يمكن للجامعة الأردنية للعلوم والتكنولوجيا أن تقوم به كمركز معرفي له إسهاماته في الدفع بعجلة التنمية في مجالات الاقتصاد والعمران.

تعتمد هذه الدراسة على المنهج الوصفي التحليلي ومنظومة تقييم التنمية العمرانية القائمة على المعرفة. تم إجراء مسح لاستطلاع آراء عينة من أعضاء هيئة التدريس والطلاب والباحثين وأصحاب المصلحة، بغرض جمع البيانات الضرورية لمؤشرات الأداء. وتم قياس أداء الجامعة الأردنية كمركز قائم على المعرفة ينمي الرؤى الإبداعية وحالات الابتكار.

وتشير النتائج إلى وجود الكثير من التحديات التي تقف عائقاً أمام الجامعة الأردنية في أدائها لهذا الدور المعرفي كحاضنة للشركات الناشئة وتحفيز البحث العلمي مع ضمان تنوع ضمن أعضاء الهيئة التدريسية. وعليه، خلصت الدراسة إلى أن الجامعة الأردنية للعلوم والتكنولوجيا غير مؤهلة في الوقت الراهن للقيام بدورها كمحور معرفي بكفاءة وذلك لعدة عوامل ذكرها من لهم علاقة بالموضوع. ولعل عدم وضوح فكرة المحور المعرفي من أساسه لدى فئة الطلاب أحد هذه العوامل.

وبناء على ذلك، توصي الدراسة بضرورة إحداث تحول في دور الجامعة من مجرد مركز تعليمي وبحثي إلى نواة للتنمية الاقتصادية واجتماعية. وهناك أيضاً حاجة للقيام بمزيد من البحوث في هذا الموضوع وسبل جعل الجامعات محاور معرفية.

الكلمات المفتاحية

اقتصاد المعرفة، التخطيط والتصميم المعرفي، التنمية الاجتماعية الثقافية والاقتصادية، تقنية المعلومات والاتصالات، عصر المعرفة، محور المعرفة.

AJRS
/https://albalqajournal.ammanu.edu.jo
Vol.(25) No.(2) 2022

Received: 13/1/2022
Accepted: 15/6/2022
Published: 12/12/2022
10.35875/1105-025-002-006

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for Research and Studies

Evaluating the Role of Universities as Knowledge Hubs: Jordan University of Science and Technology as a Case Study

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Abstract

Considering the substantial contribution of universities to the economic, urban, and social development, the role of universities as knowledge hubs (KHs) has been recently attracting attention of researchers worldwide. The study aims at evaluating the role of Jordan University of Science and Technology (JUST) as a locus of knowledge enhancing its performance and impact on economic, urban, and social development. The study approach consists of a descriptive analysis using knowledge-based urban growth assessment systems. A survey investigating opinions of a sample of faculty members, students, experts and stakeholders was undertaken to collect the required data on performance indicators. The performance of JUST as a knowledge-based center for urban growth nurturing creative visions was evaluated. The results indicate the existence of many limitations thwarting JUST to become a business incubator with the potential to support embryonic companies, promote scientific research, and ensure diversity of faculty members. The conclusion is that JUST is not yet capable of fulfilling the requirements of a knowledge hub. Many stakeholders have suggested various factors impacting the performance of JUST. The ambiguity of the knowledge hub concept to student population is one such factor. It is recommended that a shift of the university role as a center of learning and research to an economic and social nucleus should be made. More research work needs to be undertaken on this topic to explore the process of making the university as a knowledge hub.

Key words

Information and Communication Technology, Knowledge City, Knowledge Economy, Knowledge Hub, University, Urban Planning.

Introduction

By the end of the twentieth century, the notion of Knowledge Age emerged as a new concept to describe a period where knowledge is no longer what it used to be. Nowadays, knowledge is considered as a key resource and a commodity that can be used and exchanged. As a result, the concept of knowledge workers came into being to describe the people who are skillful enough to use and manage this powerful resource. In fact, the people working in the knowledge industry require a different set of skills from those working in traditional fields like industry and commerce.

A Knowledge Hub (KH) is a set of knowledge-intensive organizations placed in both public and private sectors. Some KHs are research-intensive knowledge producers such as universities and Research and Development (R&D) units. Others demand knowledge users, including companies and service providers like hospitals (Turpin et al., 2002). The KHs have three major functions: (i) generation of knowledge, (ii) transfer and application of knowledge (Yigitcanlar & Velibeyoglu, 2008; Zhou & Tang, 2020), and (iii) transmission of knowledge to others through education and training (Turpin et al., 2002).

The role of university in the KH concept is important as it usually practices the three principal functions of the hub as recognized by Turpin et al. (2002). It has to have an interaction with other players in this movement (Bruzzi et al., 2019; João et al., 2019). Some famous universities, well known for research, successful graduates and technological resources, are also areas of strong economic development and robust interactions with other knowledge players. But, as this is not always the case, the university's role is to spread and deepen knowledge among participants in the hub, and to generate, transfer, and exchange knowledge between these partners.

Smart, sustainable, and knowledge-based urban development (KBUD) is the catchphrase of our time, as the whole world struggles with climate, pandemic, and financial emergencies (Marques et al., 2020). The KBUD is a new paradigm of the global knowledge economy that aims at creating economic prosperity, socioeconomic order, sustainability, and good governance in cities. It is, therefore, considered as a vision or a strategy to transform urban areas into knowledge cities (KCs) promoting knowledge economy and knowledge society (Bruzzi et al., 2019).

There is a growing need all over the world to embrace the concept of knowledge city and develop its knowledge economy. However, the question of how to use urban planning mechanisms to achieve this end is yet to be resolved (Yigitcanlar et al., 2010). The main driver of the global and local economic growth is the rising Knowledge Economy (KE), which addresses the urban planning goal to achieve sustainable development via the establishment of effective urban hubs. Until now, the structures of most cities have expanded organically (Yigitcanlar et al., 2010), depending on global market forces. The traditional rules of urban planning do not include the vision and ability to produce a sustainable knowledge-based development.

This study assesses the potential for Jordan University of Science and Technology (JUST) to serve as a KH. It is located in Irbid, north of Jordan, and was established almost half a century ago. It has a leading position in higher education in the Arab world. It also has a good reputation among the Middle Eastern universities due to its highly-qualified academic and administrative staff, multi-disciplinary educational system, and broad diversity of students (Alraouf, 2018). These factors led to assess the potential of this particular Jordanian university to serve as a KH and a KBUD actor and to explore prospects of its improvement.

This research was undertaken under the contention that the university can be used as a starting point in the process of establishing knowledge community with a self-development capacity that can play a substantial role in developing a knowledge economy enriched with relevant international expertise. It evaluates the performance of JUST with reference to the world best practices of Knowledge Hub Universities (KHUs). It identifies its strengths and weaknesses in an effort to examine the prospects for further improvement in its overall performance.

pISSN: 1684-0615 / eISSN: 2616-2814 AJRS

Literature Review

The Concept of Knowledge

It is necessary to first know the meaning of the word knowledge through some definitions that appeared in a number of work papers submitted to the 'Second International Symposium on Cities of Knowledge: The Future of Cities under the Knowledge Economy', where more than a single definition for this term appeared. This term should be distinguished from some other terms that were included in those same papers so that it will be possible to understand what is meant by the knowledge cities. Concepts and definition follow.

Information: Data that are organized and arranged to meet certain needs.

Learning: The process of getting knowledge or skill.

Skill: A concept related to the practical part of learning. It answers the question of 'how to learn'.

Knowledge: A concept related to the theoretical part of learning. It answers the question of 'why to learn'. It is also defined as what people understand from the information and how they benefit from it. Moreover, it has been defined as what enables the individual and the group to face the information society in its complications and development.

Management: The art of achieving goals through labor, money, devices, different potentials, and location at a specific time. It is the basis of change and development and what stands behind success of many systems, whether economic or political systems.

Information management: Management that deals with objects (e.g., documents, designs, tables, and software codes).

Knowledge management: Management that deals with humans (innovation, intuition, adaptability, intelligence, and learning) and is concerned with critical thinking, innovation, relationships, patterns, skills, cooperation, and participation. Furthermore, it supports individual and group learning.

Knowledge has been broadly categorized into explicit knowledge and implicit knowledge. The explicit knowledge is the experiences preserved in books, documents, or any other means, whether printed or electronic. This type of knowledge is easy to get, pronounce clearly, and publish. The implicit knowledge, on the other hand, is the knowledge located in the minds of individuals and acquired by the accumulation of previous experiences. It is mostly of a personal nature, which makes it difficult to get, despite its high value, because it is stored in the mind of its owner

Knowledge Society

The knowledge society is one that uses information and knowledge intensively in all its daily living. The knowledge economy constitutes the basic nerve for its activities in which creativity and innovations are the main sources of its strength and functioning. However, to enable the widespread use of information and knowledge as a major economic resource by all active economic parties, it is necessary to provide a highly effective ICT infrastructure and develop a knowledge-based industry to allow for the free exchange of information and knowledge (de Wit-de Vries et al., 2019).

In a knowledge society, scientists, researchers and knowledge workers play a vital role. Therefore, not only knowledge and information constitute its main production factors but also the basic substrate on which its economy is based. It relies heavily on improving its competitiveness in knowledge production and dissemination on the global level. The knowledge society embraces a new economy in which patents, innovations, culture, technology, knowledge and information are its main assets instead of land, capital, real estate, factories, and machinery which constitute the resources of the traditional economy.

The knowledge society is a society in which information and knowledge are intensively used as manifestations of economic, social, cultural, and political lives, etc. Accordingly, the knowledge economy is the economy in which knowledge constitutes the basic nerve and contributes to identifying its identity, image, and, even, philosophy. Knowledge and information are a source of strength for

whichever society that possesses them. They are characterized by multiplicative ability to spread and move. Despite the difficulty of measuring the value of knowledge, what determines that value is the innovations resulting from it and the thought behind creativity in those innovations.

Features of the Knowledge Society

The knowledge society has three major features:

1. Extensive use of knowledge by all active economic parties as a major economic resource, thus increasing their performance and competitive abilities, and motivating innovation.
2. Intensive use of information/knowledge by the public in order to strengthen their activities and to know their rights and perform their duties.
3. To enable all the concerned parties to perform the above-mentioned roles, it is necessary to provide the infrastructure to the information/knowledge society, develop an industry specific to the information/knowledge industry, and to allow for the free exchange of information and knowledge.

There is a number of important indicators of the knowledge society, based on availability of which a society can be judged as a knowledge society or an information society. The most important indicators are the following:

1. In the knowledge community, there is no place for illiteracy, ignorance, and underdevelopment.

2. In the knowledge society, scientists and the knowledgeable and experienced people play an important and vital role.

3. The knowledge society pays high attention to scientific research and development.

4. The knowledge society contributes effectively to the production and development of knowledge, not only to its use.

5. The knowledge society is the society in which knowledge and information flows readily without obstacles and a society in which knowledge and information are available for all without discrimination. In this regard, knowledge and information are the fundamental features characterizing the personality of the society.

6. In the knowledge society, use of the computer and the modern communication techniques spreads and upon which depends implementation of most functions and works.

7. The knowledge society is capable of producing knowledge and information and considering them as the basic substrate on which the economy of the community is based. This means that knowledge is the most important production factors.

8. The knowledge community is the community that is capable of competing in knowledge production and dissemination on the global level.

Knowledge Economy

Control in the contemporary economy is becoming increasingly achieved by the knowledge-based economic activities. Since the last decade of the 20th century, a shift in economic activities has emerged from the traditional activities that are based on industry to new activities that are based on knowledge and information. So, the name of this new economic era becomes the 'post-industry era'. While the assets of the traditional economies are land, capital, real estate, factories, and machinery, the assets of knowledge economy are patents, innovations, culture, values system, human hobbies, knowledge, and technology.

In the new economic era, investment in knowledge has become the basis for economic growth. As Amidon (2003) said: "We are working on creating a new global economic system based on the flow of knowledge, not the technology; creativity and innovation, not solutions, systems of values, not chains (that is, slavery); the success of the stakeholders rather than satisfying them; and international cooperation, not competition. She emphasized that, in this cognitive world, human development does not depend on having more, but to be more, i.e., to become an assistant for development of the future of humanity.

pISSN: 1684-0615 / eISSN: 2616-2814 AJRS

The new, twenty-first century economy depends on a new model that is distinguished with the cooperation and win-win features advantages that are based on the participation abilities, effectiveness, knowledge, science, and skills, not on the win-lose competition model that is prevalent these days.

The main motive for emergence of the knowledge economy was development and progress in knowledge-based services and techniques. Many world capitals (e.g., Paris, London, New York, and Tokyo) have worked on strengthening their competitive capabilities by attracting and settlement of experts and the people skilled in the knowledge services industry. Merit in the evolution of these services traces back to the technical wired and wireless developments in the communication sector in general, which evolves at an amazing speed. To shift to the knowledge economy, with all what this concept carries of challenges and difficulties, it is necessary to start with the schools and universities so that knowledge and means that support and preserve their collection, and, eventually, production, will be the eventual produce of the education system in society.

Nature of the Knowledge Economy

The World Bank defines the knowledge economy as an economy that achieves the effective use of knowledge for achievement of economic and social development. These days, knowledge has become the main engine for economic production and growth. In addition, the concentration on information and technology principle has become on of the main factors in the economy. Information has become a fundamental economic resource that has its particularity. Rather, it is the new strategic resource that is complimentary to the natural resources in the economic life. The information technology constitutes an essential element of economic growth. Further, investment in information has become one of the production factors as it leads to increased productivity and creation of new jobs.

The information-, or knowledge-based economy or knowledge works on, first, making profound substantial change in the work structure and environments within the economy itself. It also works on re-engineering the performance ways and the working and thinking methods that control the economic institutions themselves so that they will prepare for the information-based work. In the knowledge economy, the proportion of the value added to knowledge increases greatly. The knowledge, or information, commodities have become of very high importance. The Internet has an important role in transition to the knowledge-based knowledge economy, in which the knowledge added value increases largely.

Knowledge Economy Requirements

The new knowledge economy is based on a win-win sharing model rather than on the win-lose competition model still prevalent these days. Cities like Paris, London, New York, and Tokyo have opted for this new economy and society and are working hard to offer knowledge-based services and techniques to attract knowledge creative workers. They have developed state of the art technical wired and wireless services in the communication sector. The educational sector with its schooling system, universities, R&D and research institutions are also of paramount importance to the promotion of knowledge economy and society (Hayden et al., 2018).

Nowadays, much of the economic growth and production is achieved by the effective use of knowledge and information. Information technology has become the main engine for increasing economic productivity and creating new jobs. This knowledge-based economy has not only changed the work environment but also re-engineered the performance ways and the thinking methods that control the economic institutions themselves to prepare for the information-based work.

For this knowledge economy to perform efficiently, some requirements must be met. First and foremost, public expenditures must be restructured to increase the funds devoted to enhancing knowledge and its institutions, starting from the school to university education with special attention on scientific research. Second, development of high-quality human capital to provide an appropriate climate for knowledge, enhance creativity and innovation and attract knowledge workers. Third, the economic and institutional framework should be reshaped to ensure a competitive macroeconomic environment, a flexible work market, and an adequate social protection. Finally, a highly advanced state-of-the-art infrastructure of the information

society must be established.

The most prominent requirements of the knowledge economy are:

1. Restructuring and rationalizing public expenditure and rationalization; making crucial increase in the expenditure devoted for enhancing knowledge, starting from the primary school to university; and focusing attention on scientific research.
2. Working on creation and development of high-quality human capital and providing the appropriate climate for knowledge.
3. Recognition of the investors and companies of the importance of the knowledge economy.

To illustrate these pillars, the World Bank has determined four requirements:

1. The economic and institutional framework that ensures a competitive macroeconomic environment, a flexible work market, and an adequate social protection.
2. Education systems, and the technology-based continuous education and training are some of the characteristics of the knowledge economy.
3. Creativity systems that integrate researchers and businessmen in commercial applications of science and technology.
4. The basic infrastructure of the information society in the fields of communications and information technology and the extent of their progress and diffusion.

Knowledge Economy Characteristics

The KE has four main characteristics:

1. Knowledge is the engine of the production process. At the same time, it is a commodity with economic implications in the market.
2. This commodity (knowledge) can not be depleted as a result of use. Rather, as its use and thinking of it increases, new knowledge results (the KE is a knowledge abundance, rather than knowledge scarcity, economy.
3. Once knowledge is created, its creator does not have the ability to monopolize it; it becomes the property of everyone.
4. Knowledge is like light, it has no weight or touch, which gives it the ability to move freely.

The KE has seven principal foundations, which are:

1. The existence of a knowledge society, in which everyone has certain extent of knowledge and the knowledge is not confined to the specialists.
2. Education. The presence of schools and universities that are capable of graduating people who think and innovate and who are free in their thinking. Therefore, it is necessary to give this element the highest attention in the public policy and spending.
3. Research and development to produce the necessary knowledge for the society.
4. The existence of laws and regulations for innovation and creativity that encourage and protect the creators.
5. Presence of networks for communication of the research and creativity centers.
6. The presence of an industry that is a partner in the process of creativity and inventions.
7. The university must have relationship with its surroundings and participate in the development of its knowledge.

Principles of Economic Administrative Change

The principles of economic administrative change are:

1. Adoption of the principle of freedom.
2. Transparency in information exchange.
3. Quick decision making.
4. Removal of the confusion and conflict between those who have information and those who need it.
5. Heightening the values of social work.
6. Activation of the culture of quality and planned work.

The university as an educational and research institution can play an important role to the diffusion and spread of knowledge and innovation within the large society. Not only the university is an engine of knowledge production but also an institution to foster knowledge society. Once produced, this commodity (knowledge) cannot be depleted. The more its use the more its spread and increase. The

pISSN: 1684-0615 / eISSN: 2616-2814 AJRS

use of knowledge begets even more knowledge. University scientists cannot monopolize knowledge they produce. It becomes the property of the larger society and every member make use of it.

Research Objectives

The objectives of this research were:

- To assess potential of JUST to act as a KH fostering a knowledge-based economy and society in the city.
- To explore the main challenges that may hinder the performance of JUST as a KH and ways to overcome them.
- To identify means of evaluating the performance of JUST as a KH. From the viewpoints of students, academic staff and stakeholders based on the KBUD approach, as presented in (Menkhoff & Evers, 2015), as the assessment measure.

Significance of the Study

The KBUD is a key driving force of knowledge-based global urban development through its enviro-urban, socio–cultural, economic, and institutional dimensions. This study starts from this point and links KBUD to a knowledge-based economy, with a focus on the three functions of the KH, namely, knowledge generation, knowledge transfer, and knowledge transmission. The study assumes special significance from the fact that it applies these concepts to the university as one of the major actors in the KBUD. By so doing, this study fills a gap in knowledge of the extent to which the university can serve as a KH. Furthermore, the study is particularly significant as it corresponds to comprehensive performance assessment that takes into consideration the viewpoints of the university students, academic staff, and other stakeholders. As will be shown later in this paper, the results support that JUST can successfully play the role of KH.

Material and Methods

Study Area

The significance of the study area stems not only from the Jordan University of Science and Technology (JUST) as a knowledge center but also from its geographic location on the metropolitan corridor linking Petra Road to Irbid in the north of Jordan, the second largest city in the country (Figure 1). It is also a constituent part of the Irbid Development Area (IDA) with an area of one km2 (Figure 2 (Markus, Dennis, & Jared, 2008).

The Jordan University of Science and Technology (JUST) is a leading knowledge provider not only in Jordan but also in the whole Middle East area (www.weinstitute.org). If offers quality teaching and research so much so that its graduates and faculty members assume important positions in various fields of activity. JUST has therefore, all the ingredients to become a knowledge hub (KH) from which knowledge will radiate all over the place. It can be a powerful engine to ensure a successful transition toward knowledge-based society, knowledge-based economy and knowledge-based urban development.

The Jordan University of Science and Technology (JUST) is important, not only as knowledge centre in the north of Jordan, but also because of its closeness to the city of Irbid, the second largest Jordanian city in terms of population next to the capital, Amman, and because of its geographic location. This university lies on the metropolitan corridor (the segment between JUST and the metropolitan center at the intersection between Petra Road and Irbid Ring Road and the segment between Ramtha city center and the center of JUST (Figure 1)) as designated in the Irbid Growth Strategy 2030 (Figure 2 (Ministry of Municipal Affairs, 2009)). In addition, about one km2 of the Irbid Development Area (IDA) is located within the boundaries of JUST (Figure 2 (Markus, Dennis, & Jared, 2008)).

Jordan University of Science and Technology (JUST) has importance as a leading teaching and research university in Jordan and in the Middle East (www.weinstitute.org). Its students and faculty members make it a distinguished university. Moreover, this university has a high impact on science and technology in Jordan and the region. Its graduates assume noteworthy positions in medical, engineering, architectural, and agricultural institutions, both in Jordan and abroad. Accordingly, it is qualified to play a big role in urban development on the social, economical, environmental, and institutional scales. If JUST qualifies as a KH, then it will become the core of the urban devel-

opment network, a powerful engine for change, a factory of humans with intellect and knowledge, and a center for business networks and industrial communities in the knowledge economy.

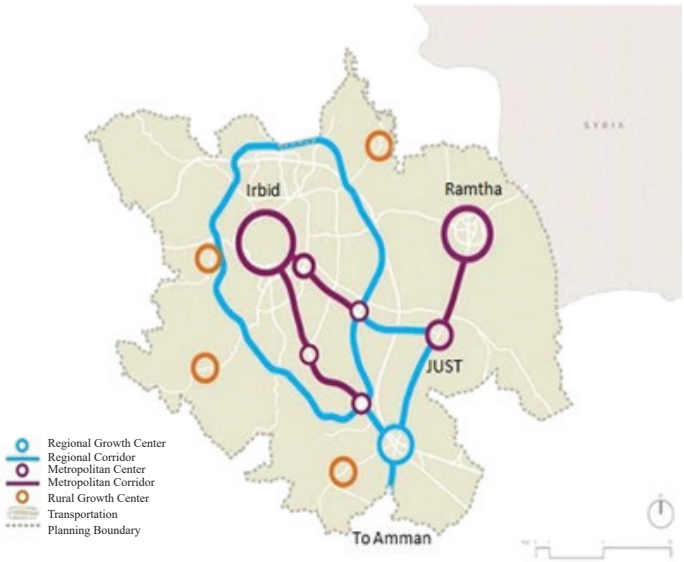

Figure (1): Irbid Development Area (IDA)

Source: Irbid Master Plan Study (2009)

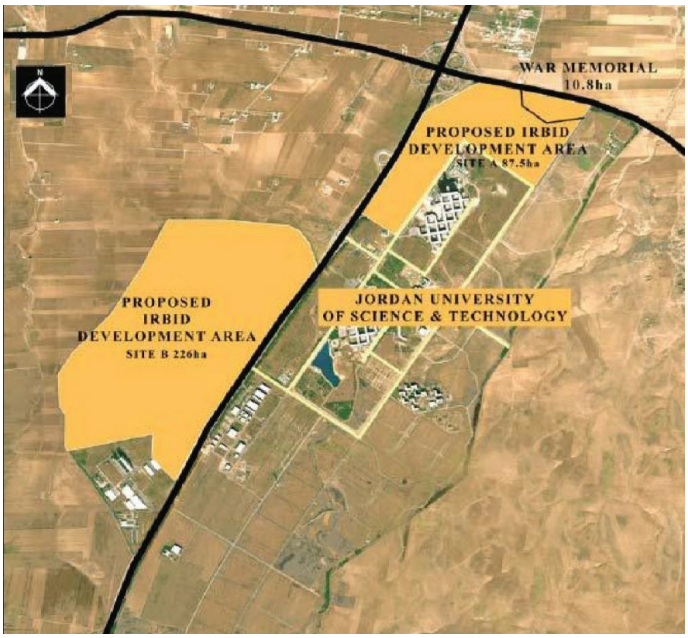

Figure (2): Irbid Regional Growth Plan 2030 (corridors and centers)

Source: Irbid Master Plan Study (2009)

Research Approach

Universities are not only a center for the creation, dissemination, and application of knowledge but also a driving force to make the transition toward a knowledge-based society and economy. To examine to what extent JUST can play such a role, a survey was conducted among faculty staff, students and other stakeholders to collect the necessary data. A questionnaire was designed for that purpose.

Universities can participate in the socio-economic development in a variety of ways, mainly including knowledge creation, dissemination, and application. In order to meet the objectives of this study, a survey was made to collect data by using a questionnaire that was designed in view of the relevant literature. Hence, this study was quantitative in nature.

Research Population

Students, academic staff, and other stakeholders of JUST constitute the study population. A questionnaire survey was distributed among academic staff and final year students in the faculties of medicine, engineering, architecture, agriculture, and science. A sample of stakeholders include public and private sector institutions and Non-governmental Organizations (NGOs) that have dealings with JUST. They tend to represent the knowledge workers in their field as they holding senior positions like managers, consultants, secretaries, and quality control supervisors, and the like.

The population of this study was students, academic staff, and other stakeholders of JUST. The academic staff sample consisted of doctoral and master's degree holders in the disciplines of medicine, engineering, architecture, agriculture, and science. Meanwhile, the sample students were selected from the students in the final stages of study in the same foregoing five faculties. In other respects, the stakeholder sample included all public and private sector institutions and Non-governmental Organizations (NGOs) that interact with JUST. By the time of data collection, the sample individual stakeholders were holding a variety of positions. Thus, the study sample included managers, consultants, secretaries, and quality control supervisors,

pISSN: 1684-0615 / eISSN: 2616-2814 AJRS

among others.

Research Instrument

The questionnaire items were for their most part extracted from a review of the literature on the reported best practices regarding University Knowledge Hubs as is the case of Massachusetts Institute of Technology (MIT), Georgia Institute of Technology (Georgia Tech), Singapore, and Masder City (Knight, 2014). The main questionnaire sections cover items dealing with Quality of life, Local community, Private sector, Public sector, Health services, Firms and R&D, Social development, Information and Communication Technology (ICT) and social media.

The tool used in this study for data collection was a questionnaire because it is a useful instrument for this type of research. A questionnaire was designed to meet the objectives of the survey based on a review of the Knowledge Hub University literature. So, some of the questionnaire questions were extracted from the literature, with particular attention paid to the best reported practices in KHs, e.g., Massachusetts Institute of Technology (MIT), Georgia Institute of Technology (Georgia Tech), Singapore, and Masder City (Knight, 2014). The questionnaire questions covered the main KH criteria, which have been confirmed through a review of literature and KH cases. The main areas that are affected by the knowledge hub universities are Quality of life, Local community, Private sector, Public sector, Health services, Firms and R&D, Social development, Information and Communication Technology (ICT) and social media.

Question Types and Format

Three questionnaire copies, one for each category, were prepared. The questionnaire about the knowledge generation and transfer function of the KH was conducted among university faculty staff. Students were asked about the knowledge transfer function of the KH, whereas questionnaire dealing with the knowledge transmission function of the KH was designed for university stakeholders. The questionnaires addressed some common items like some general questions, and two KBUD dimensions: (i) socio-cultural development and (ii) economic development. Ratings were based on a five-point Likert scale questions ranging from a score of 1 (strongly disagree) to 5 (strongly agree).

The questionnaire was produced in three copies, one each for the university faculty members (the knowledge generation and transfer function of the KH), the university students (the knowledge transfer function of the KH), and the university stakeholders (the knowledge transmission function of the KH).

The first copy of the questionnaire was designed for the academic staff (knowledge generation and transfer). It comprised two parts. The first part was made up of general questions while the second part consisted of 17 items that addressed two KBUD dimensions: (i) socio-cultural development and (ii) economic development. This copy included the same general questions presented in the first copy of the questionnaire, followed by 10 items to address the same foregoing two KBUD dimensions, i.e., socio-cultural development and economic development.

The third copy of the questionnaire targeted the university stakeholders (knowledge transmission). Structurally, it was similar to the first and second parts of the questionnaire. Specifically, besides the general questions, it included 12 items that address the socio-cultural development and the economic development dimensions of the KBUD. Rating was based on the five-point Likert scale, with a range of scores of 1 (strongly disagree) to 5 (strongly agree).

Research Framework

The major steps followed by the researchers to achieve the goals of this study are illustrated in Figure 3. The study progressed in four steps. In the first step, the research idea was formulated and the main performance indicators were identified. In the second step, a questionnaire was developed and distributed to collect data. In the third step, the data were analyzed statistically. In the forth step, the analysis results were interpreted and discussed. Further, conclusions were drawn from the results and recommendations were given (Figure 3).

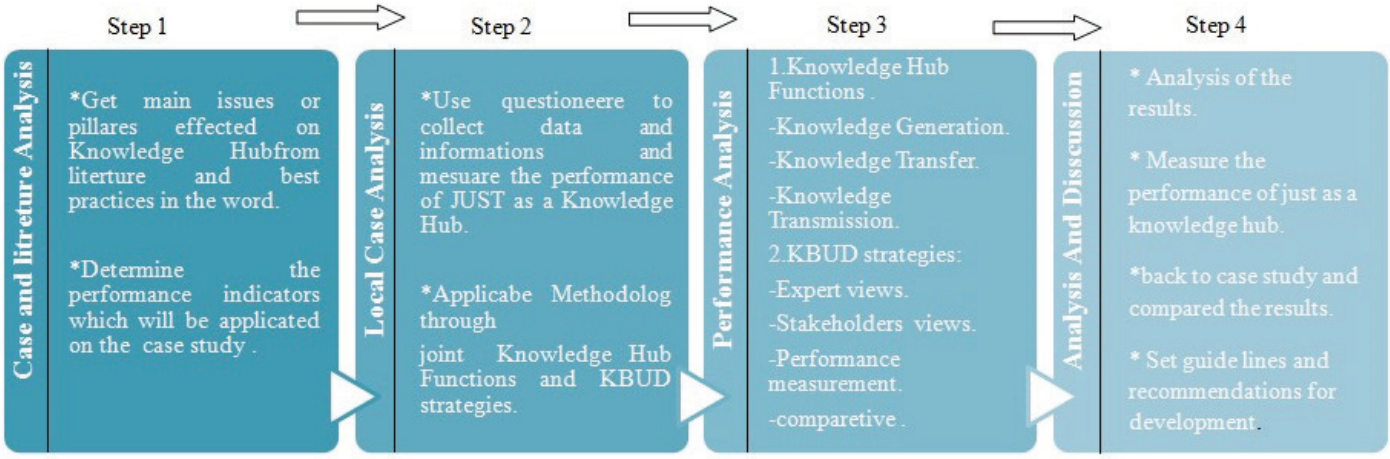

Figure 3: research framework
Source: The researchers

Results and Discussion

In order to assess JUST potential to become a knowledge hub, we started with appraising whether the university is performing enough to foster knowledge and form quality knowledge workers. The targeted groups were asked to evaluate the performance of JUST as a KH on a five-point Likert scale. The mean scores of the respondents on each variable (or measure) were categorized into three levels: low, medium, and high, corresponding to the mean scores of 1-3.5, 3.6-4.2, and 4.3-5.0 (Figure 4).

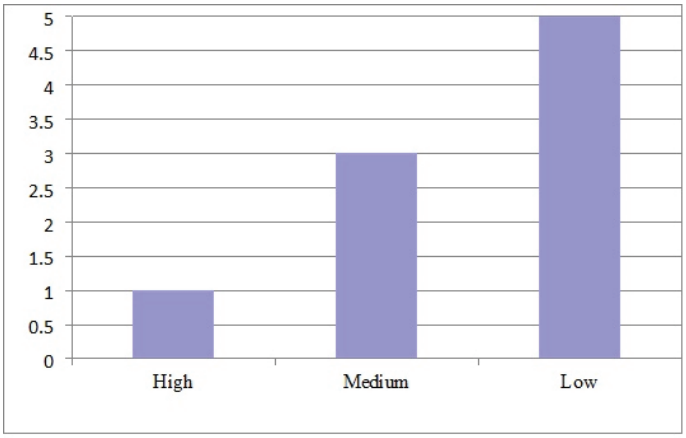

Figure 4: categorization of mean scores into three levels

Students' Perspective

When asked whether they are familiar with the term 'knowledge hub', only 40% of students declared they are aware of (Figure 5). One of the questionnaire items investigated familiarity of students with the 'knowledge hub' term. The analysis results (Figure 5) show that only 40% of the students had heard about this term.

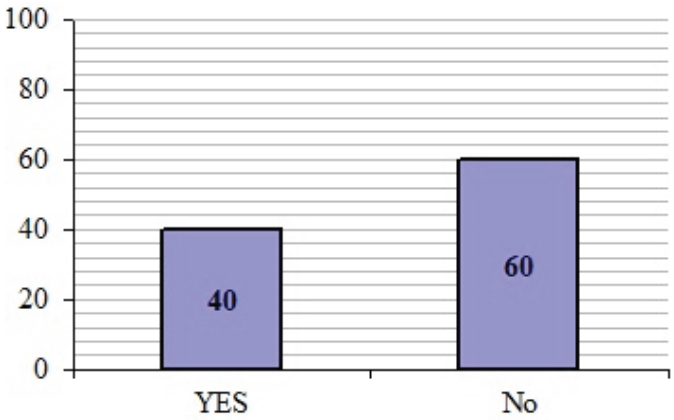

Figure 5: familiarity of students with the knowledge hub term

When examining how students see the performance of JUST as a knowledge hub, the results did not display higher ratings as shown in table 1 and figure 6. Only the variable related to student diversity that was highly rated. This is due to the fact that the number of students currently enrolled in the university is almost 24,000 students, including more than 5,000 students from 50 nationalities, making JUST the most culturally-diverse university in Jordan. The ratio of the international students (about 1 out of 5) is fairly high in comparison with other Knowledge Hub Universities (Yigitcanlar, 2014). For example, the ratio of the international students at the National University of Singapore (NUS) is around 33% (Menkhoff & Evers, 2015). Four other performance indicators were rated by JUST students' sample as medium whereas the other remaining four were evaluated as being low. These performance indicators included employment opportunities, innovation and entrepreneurship, diversity among the teaching staff, and communication skills. The lowest rated performance

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indicator was that of employment opportunities since the university is already well established, fewer new job opportunities are thus created.

When looking at students' views regarding the socio-cultural development dimension, the weighted mean for the six variables aggregated composing it was rated medium (3.66). However, this was not the case for the economic dimension as measured by employment opportunities, vocational training and student incentives was rated low (3.29) (Table 1). This is an indication that JUST tend to suffer a serious handicap as an economic engine creating jobs, providing skills and incubating startups. This conclusion was substantiated by the low overall rating (3.35) denoting student opinion regarding the JUST performance as a knowledge hub.

Although there is a Center of Excellence in Innovative Projects at the university that was established five years ago, it is not yet functioning effectively up until now. Many students were not even aware of its activities, and many others did not know that such a center ever existed. With regard to 'Innovation and Entrepreneurship', the respondents declared they did not perceive any innovation culture in the teaching methods the receive. Yigitcanlar asserted that the culture of innovation has always been notably lacking in many schools as well as many universities he studied (Yigitcanlar, 2014). Taking note of such weakness, JUST is currently reviewing its curricula to embrace innovation in its programs.

Massachusetts Institute of Technology continuously updates its curricula and teaching methodologies to encourage the innovation culture within its students, develop their self-confidence and the entrepreneurial skills to engage in venture practices (Reif, 2011). Concerning diversity of the teaching staff, Jordan University of Science and Technology has 965 faculty members, comprising 945 Jordanians and 20 faculty members of eight nationalities, representing nearly 2.1% of the teaching staff. This ratio is extremely low compared with the corresponding ratios in other Knowledge Hub Universities like NUS For example, where the ratio of foreign teaching staff amounted to around 52%.

Academic Staff's Perspective

When JUST faculty members were asked whether they were familiar or not with the 'Knowledge Hub' concept, around 59% responded positively (Figure 7). However, the fact that about 41% of faculty declared to have never heard of the term knowledge hub may not reassuring to JUST in its endeavor to become a knowledge hub.

As far as the assessment of JUST performance from the viewpoint of faculty members is concerned, the results presented in Table 2 and Figure 8 show quite lower ratings for nearly all performance indicators. Present the results of assessment of performance of JUST from the viewpoint of its faculty members. As can be seen in this table and figure, none of the performance indicators was rated as available at high level. Indeed, eleven out of sixteen indicators scored lower ratings, while only five managed to record a medium level. The indicators that were rated low were diversity of the teaching staff, the university as a business incubator, contribution of JUST to the establishment of start-up companies, and commercialization of scientific research (Table 2).

When assessing the faculty's opinion regarding the socio-cultural dimension as depicted the seven variables shown in table 2 below, the weighted mean was quite low (3.35) indicating that JUST suffers some serious drawbacks its innovation and creativity, staff diversity and joint research efforts and team work. As far as the economic dimension is concerned, here again, the weighted mean was as low as 3.11. The overall mean for all the variables covering both dimensions was very low 3.23 revealing the weaknesses that JUST needs to address if it aspires to become a knowledge hub in the region.

Table (1) Performance of JUST from students' perspective.

No.	Evaluation	Performance Indicator	Mean	Level	weighted Mean	Overall mean
1	Socio-Cultural Development	Reputation	3.88	Medium	3.66 (Medium)	
2		Innovation and entrepreneurship	3.27	Low		
3		Communication skills	3.43	Low		
4		Services and facilities	3.83	Medium		
5		Diversity of teaching staff	3.31	Low		3.35 (Low)
6		Diversity of students	4.24	High		
7	Economic Development	Vocational training	3.46	Low	3.29 (Low)	
8		Employment opportunities	2.79	Low		
9		Incentives for students	3.62	Medium		

Table (2) Performance of JUST from faculty members' perspective.

No.	Dimension	Measure	Mean	Level	weighted Mean	Overall mean
1	Socio-Cultural Development	Building awareness	3.27	Low		
2		Innovation	3.18	Low		
3		Collaboration	3.73	Medium		
4		CPD	3.48	Low	3.35 (Low)	
5		Team work	3.30	Low		
6		Diversity of staff	2.55	Low		
7		Diversity of students	3.91	Medium		
8	Economic Development	Knowledge transfer	2.93	Low		3.23 (Low)
9		Job security	3.61	Medium		
10		Joint venture projects	3.54	Medium		
11		Economic development	2.96	Low		
12		Financial and knowledge exchange	2.96	Low	3.11 (Low)	
13		Commercialization	2.86	Low		
14		Secondment	3.61	Medium		
15		Start-up companies	2.77	Low		
16		Business incubators	2.75	Low		

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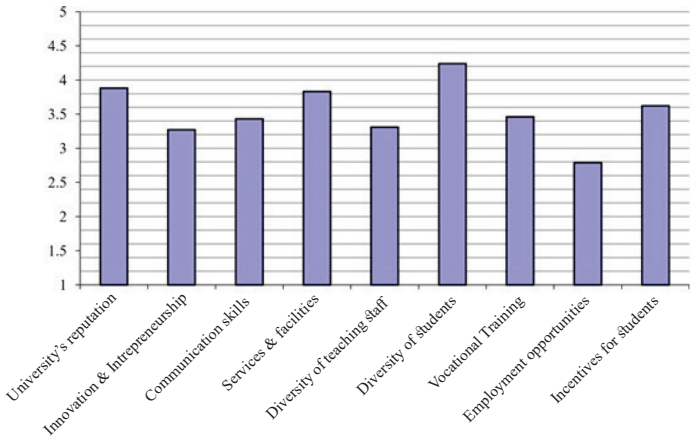

Figure (6) scores on the performance indicators from students' perspective.

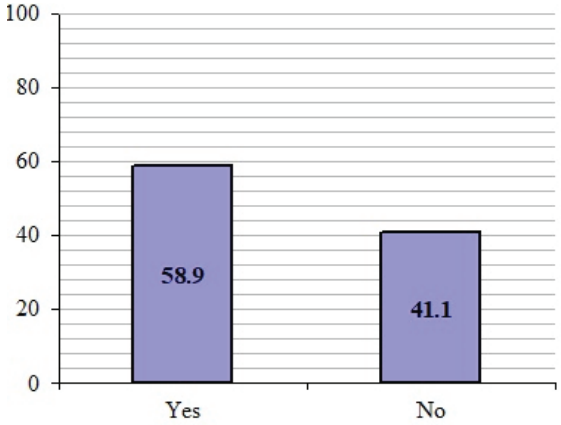

Figure (7) familiarity of faculty members with the knowledge hub term

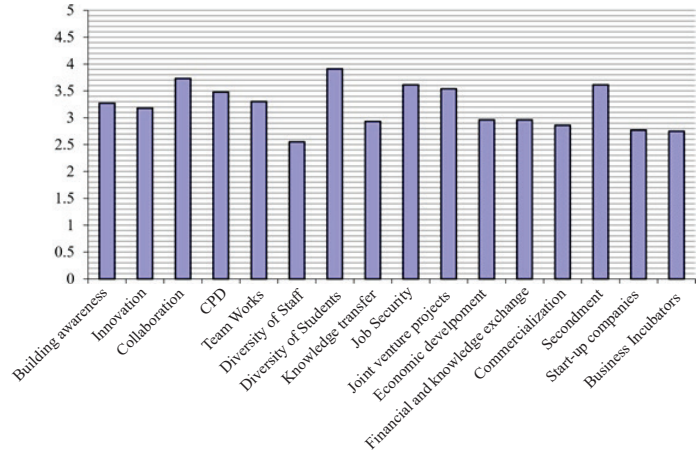

Figure (8) scores on the performance indicators from faculty members' perspective.

Diversity of teaching staff was the lowest rated item by JUST faculty members. As stated above, being a well-established institution JUST was unable to offer newer job opportunities. The second least valued item was the indicator measuring JUST potential as a business incubator. Although, the Jordan University of Science and Technology is currently incubating three projects, one of which began as a start-up company, it still terribly suffers from a lack of awareness among the academic staff, students, and stakeholders about its role as a Center for Excellence for Innovative Projects.

Regarding the commercialization of scientific research indicator, it did not score a higher rating than the two previous ones. There seems to be little partnership between JUST and the industry sector. This assertion is corroborated by the fact that most of JUST faculty members tend to undertake their scientific research solely for the purpose of academic promotion rather than for scientific production per se. The reasons may lay in a deficiency of research commercialization funding and weak connection between the university and the industry due to lack of coordination and collaboration. As a result, the university may not be in a position to clearly identify the needs of the industry let alone to be able to respond to it. Such a coordination is of paramount importance for academic research to shift the focus to meet the needs of the local industry sector.

The foregoing results were in sharp contrast with the best practices of knowledge hub universities such as the case of Georgia Tech, which was a startup project incubator and also the oldest university-based technology incubator in America. In 2013, the Advanced Technology Development Center (ATDC) had served over 400 companies and created more than 7,300 technology jobs. As a complement to ATDC, Venture Lab was created to convert Georgia Tech research into startups. This center serves all Georgia staff and students who have interest in forming startup companies (Owen, 2014). Additionally, Georgia Tech has a Venture Lab that commercializes and transforms innovations into companies. In 2013, Venture Lab evaluated 200 technologies and attracted more than US$52 millions in investment capital. It created more than 675 new jobs in the state of Georgia. As well, it had helped launch more than 150 new companies that have attracted more than US$700 millions of outside funding.

Stakeholders' Perspective

The distribution of the sample stakeholders within the public, private, and non-governmental sectors is displayed in Figure 9. The Analysis reveals that the three sectors have very close representation of the sample stakeholders. The proportions of the stakeholders were 36.2%, 33.3%, and 30.4% in the private, non-governmental, and public sectors, respectively (Figure 9). In addition, the analysis uncovers that 59.4% of these sample stakeholders were already familiar with the 'Knowledge Hub' term (Figure 10).

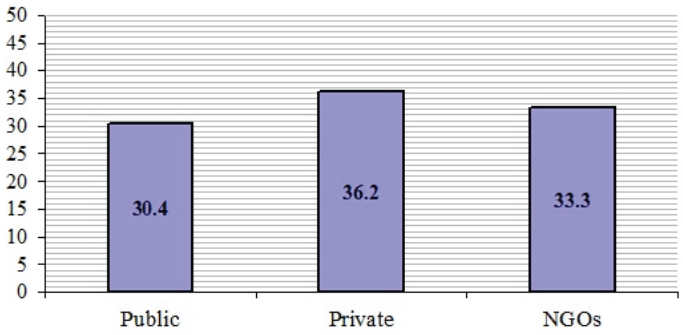

Figure (9) distribution of stakeholders by sectors

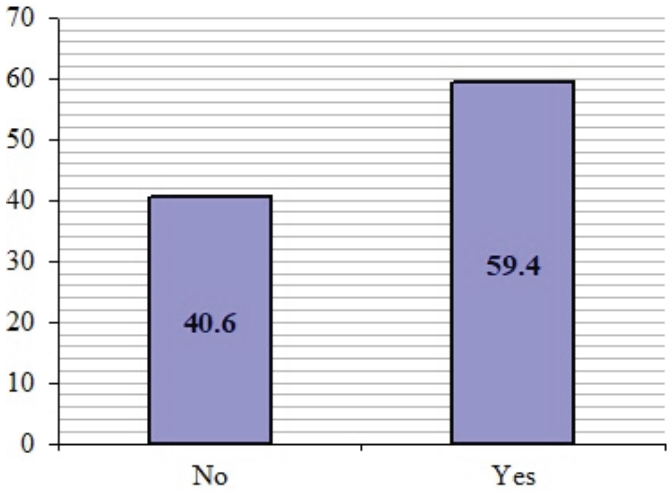

Figure (10) familiarity of stakeholders with the knowledge hub term

Both table 3 and figure 11 display the results of JUST performance assessment from the stakeholders' viewpoint. Various stakeholders tend to share similar stances regarding all the indicators measured. They all rated them quite low signifying that JUST is not yet ready to becoming a knowledge hub (Table 3 and Figure 11). They hold the view that JUST as it currently stands, does not seems to be qualified to curate business incubators nor to establish start-up companies or commercialize scientific research.

In addition to the aforementioned reasons related to these specific three indicators, the lack of knowledge among the stakeholders about the role of the university as a business incubator and its contribution to establishing start-up companies is to blame. Some industries tend to have strict information protocol disclosure which may inhibit any cooperation or even information dissemination to university researchers. This lack of communication between the stakeholders and the university may have had some serious repercussions on partnership launch between JUST and the industry sector. Moreover, the foregoing findings may also be explained by the limited awareness of faculty members and students of industrial needs and of business entrepreneurship and also by the lack of trust between the academic and the industrial sectors. Although, Jordan University of Science and Technology has established a coordination office at Al-Hasan Industrial Estate to overcome these obstacles and become responsive to the industry needs, it was unable to open its doors for five years now (http://www.jiec.com/en/industrial_estates/4/).

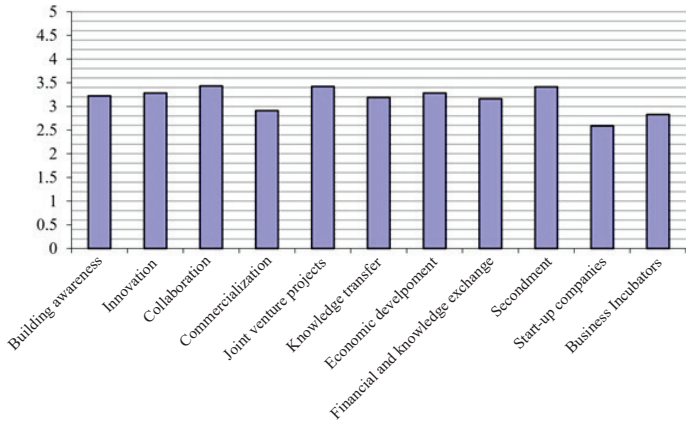

Figure (11) scores on the performance indicators from Stakeholders' Perspective.

The stakeholders tend to hold a very low opinion on JUST potentials to become a knowledge hub as measured by the eleven variables depicting the socio-cultural and economic dimensions as indicated by a weighted mean rating as low as 3.15. Both dimensions scored low as 3.31 for the socio-cultural dimension and 3.09 for the economic dimension as shown in table 3 above.

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Table (3) Performance of JUST from stakeholders' perspective.

No.	Dimension	Measure	Mean	Level	weighted Mean	Overall mean
1	Socio-Cultural Development	Building awareness	3.22	Low		
2		Innovation	3.28	Low	3.31 (Low)	
3		Collaboration	3.43	Low		
4	Economic Development	Commercialization	2.91	Low		
5		Joint venture projects	3.42	Low		
6		knowledge transfer	3.19	Low		3.15 (Low)
7		Economic development	3.28	Low	3.09 (Low)	
8		Financial and knowledge exchange	3.16	Low		
9		Secondment	3.41	Low		
10		Start-up companies	2.59	Low		
11		Business incubators	2.83	Low		

Conclusion and Recommendations

Universities are the main institutions set up to curate knowledge and manage development tools. Not only they generate knowledge but they also transfer and spread it at the local, national, and international levels. As far as the performance of Jordan University of Science and Technology as a hub for knowledge production and dissemination is concerned, the analysis revealed many drawbacks and various impediments. Out of the sixteen indicators assessed, JUST scored surprisingly low on both measurement dimensions, which is socio-cultural development and economic development. When comparing the stances about JUST potentials to becoming a knowledge hub of its three main categories, students, faculty and stakeholders, the overall mean scores were low for two categories (faculty 3.23 and stakeholders 3.15). The student category did relatively better with an overall mean score of 3.35, which is a medium level. When examining the performance of each category on each dimension separately, no category managed to score high on any dimension. These results indicate that JUST need to make strong efforts to improve its performance at both the socio-cultural and economic dimensions.

Reaching out to the community outside the university is a must. JUST should strategize a new mission on top of the core, one that is to bestow teaching and undertake research. The new mission should consist of working with the community to support its social and cultural development. For that, it is important to understand the community's problems and needs and attempt to tackle and respond to them. At the economic level, JUST ought to collaborate with the industry in a win-win relationship to foster innovation, startups creation and business incubation. University research should also be geared to solve the issues faced by the industrial sector, which would enhance the trust between university research centers and companies. Commercialization of research and collaboration with enterprises should be part of JUST strategy. Overall, Jordan University of Science and Technology has the role of establishing balance of the 'triple helix' model of the private sector, public sector, and the community, while playing a key role in planning and developing the areas surrounding the university. It is about time for JUST to make the shift from a simple center for learning and research to an

economic and social development engine or knowledge hub (KH) to fit the new web community and the rising knowledge economy. The low scores of the three categories (faculty, students and stakeholders) opinions regarding the socio-cultural dimension reveals that knowledge transfer between JUST and the larger society faces many challenges and that more studies need to be conducted to overcome them. The fact the economic dimension ratings for all categories were also low is an indicator that JUST researchers are focusing more on "science-to-science" achievements to serve their academic careers rather than on the exploitation of research results and procurements of patents by the industrial sector.

In short, the re-planning and re-design of the competitive framework of JUST is ongoing to promote the development of the information service sector in this university and enforce its status as the headquarters of information and communication in the Middle East. It should be noted that ongoing attempts to draw some elements of physical expectations of the knowledge city, as has been devised for the case of JUST, are not considered as complete; there is a need for preparation of new research and analysis to investigate the impacts of the information and communication technology (ICT) projects on the uses of the lands of JUST and on its urban form, Furthermore, there is a need for preparation of a number of studies and research works that anchor on illustration of the sophisticated relationships among the social content of the university and its urban texture and the rising KE. This study lends support to Al-Awawdeh (2017) finding suggesting the set of a strategic planning for the Jordan University of Science and Technology would boost innovation and creativity.

Conflict of interests

The authors declare that there is no conflict of interest

Funding Statement

This work did not receive any funding.

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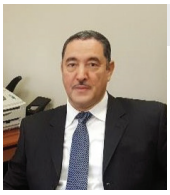

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