# Measuring the Effectiveness of Organizational Knowledge Based Economy

**Ghassan Kbar and Abdul Aziz AlDusari**
**Riyadh Techno Valley, King Saud University, Saudi Arabia**
gkbar@ksu.edu.sa
gahkbar@yahoo.com
adawsari@ksu.edu.sa

**Abstract:** Effective Knowledge Management (KM) is an important process for handling information which is essential for implementing successful projects and making improvement to the knowledge-based economy. KM deals with how knowledge is produced, shared in a secure manner, and used by organizations or individual for the benefit of the economy. Sharing of information and knowledge as well as providing the relevant financial support are among the main success factors for creating innovations, while protecting the Intellectual property (IP) satisfies the requirement for sharing of knowledge fairly and preserving the right of the inventors. In order to achieve an effective KM that contributes to the overall knowledge economy, there should be a proper way to measure it according to well known set of criteria. In this paper an analytical method has been devised based on different performance indicators to verify the availability of useful knowledge which is linked to successful knowledge investment and its business continuity. Unlike other methods that focus on descriptive approach, the proposed analytical method relies on qualitative approach that is based on how the probability of the knowledge factors can occur in a certain environment in relation to the set of goals that have been identified for a certain organization. This new method would allow managers to evaluate the performance of knowledge based economy of different organizations and assist them in identifying the reason for lacking economy growth, and therefore plan for improvement. Another way for measuring the effectiveness of a fair partnership model can rely on a direct method using a statistical survey to collect the statistical data that can help in identifying obstacles in reaching the organization's goals. An example for measuring the effectiveness of fair partnership has been described in this paper by using a survey which has been conducted to evaluate projects that are running in Saudi Arabia in order to understand the difficulties in attracting funds through a Venture Capital program, so the proper solutions can be recommended.

**Keywords**: knowledge economy, measuring effectiveness, performance indicator, assess of knowledge

## 1. Introduction

New information that is created by individual or group would become useful knowledge once is shared among other and used to improve the operation of related phenomenon. In this era, the *computer technology* contributes so heavily to superabundance of information which starts to become part of the *solution for knowledge management KM*, in a variety of domains. By the mid-1990s, knowledge management initiatives were flourishing because of the wide spread of the Internet. The International Knowledge Management Network (IKMN), begun in Europe in 1989, went online in 1994 and was soon joined by the U.S.-based Knowledge Management Forum and other KM-related groups and publications. In 1994 the IKMN published the results of a knowledge management survey conducted among European firms, and the European Community began offering funding for KM-related projects through the ESPRIT program in 1995. Knowledge is not only about creation of information, but rather about *developing certain pattern and distributes it efficiently* to *selective people*. The mechanism of creation of knowledge, storing it, sharing it and dissemination and how to convey them meaningfully to some other person is called knowledge management (KM).

KM relates directly to the *effectiveness* with which the managed knowledge enables the members of the organization to deal with today's situations and effectively envision and create their future (bel97a 2004).

A sound KM depends on its effective distribution and not only on its efficient production. This can be done through *secure Wireless network* that has the advantages of *flexibility*, *mobility*, *easy administration, reducing the information-related risk,* and support of security (G. Kbar 2005).

Wireless Local Area Network (WLAN) technology is rapidly becoming a crucial component of computer networks that widely used in the past few years (Jim 2002), (Rob 2001), (Signa 2001), and (Nortel 2001). It provides mobility as well as essential network services where wire-line installation proved impractical. The inclusion of the newer IEEE 802.11g versions of the standard offers a firm basis for high performance wireless LANs. Companies and organizations are investing in wireless

networks at a higher rate to take advantage of mobile, real-time access to information. However, users of wireless technology need to be aware of its performance in term of *coverage*, *throughput*, *accessibility* and *security*. The security factor is critical in wireless LAN. There are many research papers discussing how to improve the security of wireless system to an equivalent or better rate than wired LAN (Nortel 2011), (Lisa 2001), (Schwartau 2001), (Dave 2002), and (Blackwell 2002). Successful collaborative platform strategies provide value for users by improving knowledge sharing. This encourages many enterprises that have been tantalized by the promise of collaborative technologies claiming to offer everything from better innovation to streamlined workflows. However successful sustainable collaborative platform strategies must be designed, from the ground up, around three major factors, which are usability, impact on end user, and organizational readiness. Collaborative platform success is dependent on user adoption and adoption is based on thoughtful design and forward-thinking enterprise processes (nGenera 2010). A knowledge society is an indication of the ability of society to produce and use of knowledge as well as sharing of knowledge using the proper technology (Paul 2003). Networks encourage sharing of knowledge and play an important role for bringing innovation-specific resources and expertise for entrepreneurial teams to create new opportunities (Rothwell 1991), and (Zaheer 2005). Stakeholders such as government agencies, universities, science parks, suppliers and competitors have a great influence on innovation (Gibb 1995). In addition, partnership between industry and universities has been considered in many countries as part of national policies to strengthen innovation. Most innovative firms, around 90%, had formal links with universities according to study done by Wilkinson et al. (1996). Additionally, a significant relationship was found between the introduction of new products and university networking (Freel 2003). Hence, collaboration among universities and industries as well as government agencies, science parks and investors is highly recommended for successful innovative products. In order to benefit from the innovations through creating or enhancing the characteristics of associated products at science parks, investors need to be encouraged for spending enough funds for the development. This can be done by providing a fair partnership model that intends to identify the role, right, and responsibility of each party as described in (kbar 2011), in addition to providing a good incentive program to attract the Venture Capital (VC) fund to support the project development.

A READINESS ASSESSMENT is a necessary part of 'due diligence' in any serious new initiative, most especially so in corporate business, where a failed initiative is more often than not painfully costly (Ann 2008). With respect to the company's knowledge and KM status, the KeKma-Audit (Ann 2008) READINESS Analysis is designed to determine/show: the Current READINESS State, the Desired READINESS State, the READINESS Gap State (difference between current & desired state), the True READINESS State (what is perceived vs what really is), the Necessary ACTION (what needs to done to bridge gaps). The method used in KeKma-Audit can be used for determining the organization's readiness not only to implement KM, but also its readiness to be truly a knowledge-based, knowledge driven organization. However, this method focuses on the descriptive questions/answer approach to determine the gap, which can't be quantified to measure the organization performance. In this paper a new analytical method that is based on how the probability of the knowledge factors can occur in a certain environment has been suggested to quantify the performance of certain organization. This new method would allow managers to evaluate the performance of knowledge based economy of different nations or organizations and assist them in identifying problems and guide them on how to plan for improvement.

## 2. Measuring the effectiveness of Knowledge Based Economy (KBE)

The World Bank invented a method for assessing the knowledge which is known as "Knowledge Assessment Methodology (KAM)" (Worldbank 2011). This method includes 109 parameters which can be used to assess the core of knowledge-based economy that is associated with economical incentive, education, innovation, and ICT. This method didn't consider the correlation that might exist between the different parameters used in this assessment. In addition, these parameters that are used for measuring the effectiveness are grouped in 8 elements. These elements are economical performance, system of economy, government, innovation system, education system, workers, equal employment opportunities, and ICT. Evaluation of these parameters is subjective and is based sometime on absolute values, or relative values. In order to complete the assessment of a particular country, it requires to cover the 109 parameters, where many variables have to be considered. These variables include some of the indices such as; annual GDP growth, human development index, poverty index, composite risk rating, capital formation, trade, tariff, IP, export, interest rate, rule and law, regulatory quality, political stability, control of corruption, research, publication, employment, technology, and many other parameters. To simplify the procedure, the World Bank reduces the

 

grouping into six which are Knowledge Economy Index, Knowledge Index, Economic Incentive, Innovation, Human capital, and ICT. Table 1 presents some of the results given by the KMA 2009 measurement (info.worldbank 2009).

**Table 1**: KEI and KI indexes (KAM) 2009

| Rank | | Country (click on the name to see basic scorecard) | | KEI | KI | Economic Incentive Regime | Innovation | Education | ICT |
|---|---|---|---|---|---|---|---|---|---|
| 1 | +2 | Denmark | ✖ | 9.52 | 9.49 | 9.61 | 9.49 | 9.78 | 9.21 |
| 2 | -1 | Sweden | | 9.51 | 9.57 | 9.33 | 9.76 | 9.29 | 9.66 |
| 3 | -1 | Finland | | 9.37 | 9.39 | 9.31 | 9.67 | 9.77 | 8.73 |
| 4 | ● | Netherlands | | 9.35 | 9.39 | 9.22 | 9.45 | 9.21 | 9.52 |
| 5 | +2 | Norway | | 9.31 | 9.25 | 9.47 | 9.06 | 9.60 | 9.10 |
| 6 | +6 | Canada | | 9.17 | 9.08 | 9.45 | 9.44 | 9.26 | 8.54 |
| 7 | +2 | United Kingdom | | 9.10 | 9.06 | 9.24 | 9.24 | 8.49 | 9.45 |
| 8 | +6 | Ireland | | 9.05 | 8.98 | 9.26 | 9.08 | 9.14 | 8.71 |
| 9 | -3 | United States | | 9.02 | 9.02 | 9.04 | 9.47 | 8.74 | 8.83 |
| 10 | -5 | Switzerland | ✖ | 9.01 | 9.09 | 8.79 | 9.90 | 7.68 | 9.68 |
| 11 | -3 | Australia | | 8.97 | 9.08 | 8.66 | 8.88 | 9.69 | 8.67 |
| 12 | +3 | Germany | | 8.96 | 8.92 | 9.06 | 8.94 | 8.36 | 9.47 |
| 13 | +4 | Iceland | | 8.95 | 8.76 | 9.54 | 8.07 | 9.41 | 8.80 |
| 14 | -3 | New Zealand | | 8.92 | 8.97 | 8.79 | 8.66 | 9.78 | 8.46 |
| 15 | -5 | Austria | | 8.91 | 8.78 | 9.31 | 9.00 | 8.48 | 8.85 |
| 16 | -3 | Belgium | | 8.80 | 8.77 | 8.87 | 8.93 | 9.14 | 8.25 |
| 17 | +2 | Luxembourg | | 8.64 | 8.37 | 9.45 | 9.00 | 6.61 | 9.51 |
| 18 | +3 | Taiwan, China | ✖ | 8.45 | 8.79 | 7.42 | 9.27 | 7.97 | 9.13 |
| 19 | +1 | Singapore | | 8.44 | 8.03 | 9.68 | 9.58 | 5.29 | 9.22 |
| 20 | -4 | Japan | | 8.42 | 8.63 | 7.81 | 9.22 | 8.67 | 8.00 |

In this paper, to validate the performance of Knowledge based Economy for certain nation, a quantitative Knowledge Base Economy (KBE) assessment methodology has been used to evaluate the outcome based on identified Key Performance Indicators (KPI) as shown in the next subsection. This new method try to simplify the measurement performance procedure based on defining a new set of groups and parameters. By looking at the topic of sustainable nation's knowledge based economy, we can determine three main indicators which affect the KBE performance those are knowledge, investment, and Business continuity. Each of these elements group is associated with different parameters as will be explained in the subsection 2.1. There are different KPI group that can be used to analyze the performance of the knowledge-based economy. The first KPI can be used to check the probability of having the required useful knowledge, where KPI =100% means a nation would have all the required knowledge factors to build its economy. The second PKI is the ability to invest which can be measured by the different factors as explained in subsection 2.1, where the total PKI of 100% would mean a high success in the project investment. The third KPI is the ability to maintain the success of the business which can be measured by the different factors as explained in subsection 2.1, where the total KPI of 100% would mean of having high business project success continuity. In the subsection 2.1, the description of each performance indicators and their factors which contributes to the overall value of these indicators is included.

## 2.1 Quantitative KBE assessment methodology

In order to assess the performance of a sustainable nation's knowledge-based economy, there is a need to identify the main indicators that affect the KBE performance, as well as the elements related to them and how they are correlated to each other. There are three main keywords associated with the sustainable KBE; knowledge, investment, and Business continuity. The first main indicator associated with KBE is the required knowledge which determines the level of competency and ability to play an important role for building a strong KBE. The second main indicator is investment, which is needed for developing projects required for the success of KBE. The third main indicator is continuity of business for sustainable KBE. These three indicators (knowledge, investment and business continuity (KIC)) are the one that needs to be measured and evaluated in order to measure the effectiveness of the KBE. Furthermore, the elements associated with each of these indicators have to be identified, as well as the correlation that exists among them. There is direct correlation between the knowledge and investment indicators since it is unlikely that an investment can be done without the existence of knowledge. However, there is less dependency among the first 2 indicators and the business continuity indicator since it is mainly depends on entrepreneurship, technology infrastructure, management and leadership. A strong KBE would require an optimum value of the three indicators. Each of these indicators consists of elements or sub-indicators which can be assessed by linking them to the relevant goals of a particular organization. For example, the goals of universities can be linked to the sub-indicators of the knowledge indicator, the goals of the university's science park can be linked to the sub-indicators of the investment indicator, and the goals of business arm of the science park can be linked to the sub-indicators of the business continuity indicator. Linking these goals to elements or sub-indicators would allow us to measure them by in putting weight for each element in order to optimize the KBE creation. First, the elements or sub-indictors that constitute each of the three indicators (knowledge, investment and business continuity KIC) have to be determined. Then, the weight of each sub-indicator would be identified according to the following mechanism. By looking at the relevant goal, we can determine which of the sub-indicator is required to achieve it. Then, we can determine we can find out the repetition and percentage of these sub-indicators, and therefore we can assign weights for these sub-indictors as explained in subsections 2.1.1, 2.1.2, and 2.1.3. The first indicator of successful KBE is the Availability of Useful Knowledge (AUK). The elements associated with AUK are; *core knowledge* that can be linked to the Ability to Discover New Idea (DNI), *valuable knowledge* that is linked to the Characteristic of Additional Value (CAV) which is related to (innovation, quality of research), *recorded knowledge* that is linked to Registering of Information (RI), *applied knowledge* that is linked to Prove of New Information (PNI), *profitable knowledge* that is linked to Protecting of Knowledge (PK), *shared knowledge* that is linked to Absolute Sharing of Information (ASI). In order to quantify the value of knowledge indicator, the effect of AUK's elements on the knowledge indicator has to be assessed, and the percentage or the weight of these elements has to be determined. To determine the percentage of each element in the knowledge indicator, we can refer to the goals that have been identified for a particular national **education institution** which can contribute to the nation's KBE, and try to match these elements to the goals and then identify the repetition of each element in the defined goals. The second main indicator of successful KBE is investment indicator which directly affects the national growth economy. However, in order to quantify the investment indicator value, the effect of its elements including the knowledge indicator has to be assessed. The elements that affect the value of investment indicator are knowledge, fund, technology infrastructure, skills/experience, and management. The percentages or the values of these elements have to be determined, and their values need to be optimized in order to maximize the overall investment indicator value, that is to be close to 100%. To determine the percentage of each element in the investment indicator, we can refer to the goals of a **science park** that contributes to the investment success for a particular nation's KBE, and try to match these elements to the goals and then identify the repetition of each element in the defined goals. The third indicator of successful KBE is business continuity. The elements associated with Business Project Continuity (BPC) are; *entrepreneurship* that is linked to Entrepreneurship Ability, *existing of support and technology* that is linked to Developing the Technology Infrastructure, and *leadership management* that is linked to the Management & Leadership Performance.

In order to quantify the knowledge indicator, the investment indicator, and the business continuity indicator for King Saud University programs which contribute to the Kingdom of Saudi Arabia's KBE, the goals of the university would be used to identify the weight factors of the knowledge sub-indicators, the goals of Riyadh Techno Valley (RTV) science park would be used to identify the weight

 

factors of the investment sub-indicators, and the goals of Riyadh Valley Company (RVC) would be used to identify the weight factors of the business continuity sub-indicators as shown in Figure 1.

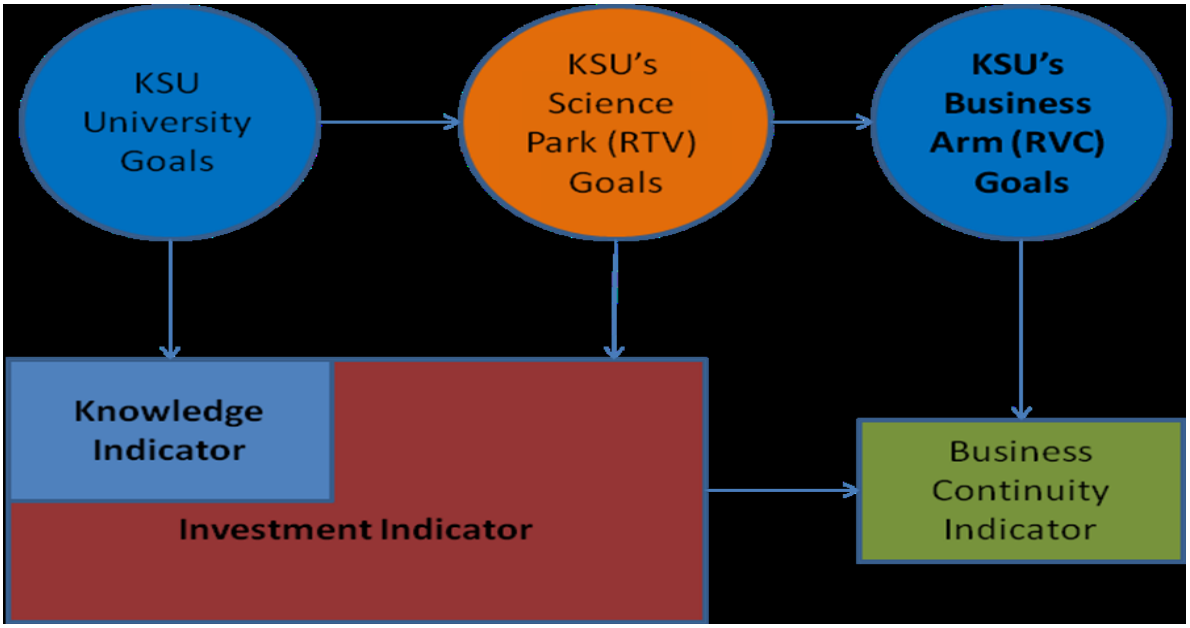


**Figure1**: Knowledge-based economy indicators for King Saud University-KSU

*2.1.1 Quantifying the knowledge indicator*

To determine the percentage of each element in the knowledge indicator, we can refer to the education system for a particular university and schools, and match these elements to their goals as explained below. For instance, let's analyze the goals of King Saud University that are listed below (ksu 2011), and match them to the elements of the knowledge indicator.

Goals of (Ksu 2011):

- Establish excellence in all fields of scholarship and research; (requires core knowledge, and valuable knowledge)
- Maintain a distinctive faculty possessing the highest credentials and abilities; (requires core knowledge, valuable knowledge, applied knowledge, and profitable knowledge)
- Provide graduate students with the best education and opportunities that will enhance their knowledge, skills and relevant experience; (requires core knowledge, and recorded knowledge)
- Building bridges locally, nationally and internationally; (requires shared knowledge, and profitable knowledge)
- Provide a supportive learning environment for faculty, staff and students; (requires core knowledge, and recorded knowledge)
- Ensuring a sustainable environment for the pursuit of excellence; (requires recorded knowledge, core knowledge, profitable knowledge, applied knowledge, and valuable knowledge)
- Establishing flexibility and accountability. (requires applied knowledge, profitable knowledge, and shared knowledge)

By looking at the above example, we can find that the core knowledge is repeated 5 times, valuable knowledge 3 times, applied knowledge 3 times, recorded knowledge 3 times, profitable knowledge 4 times, and shared knowledge 2 times. Assuming that the weighs of the above sub-goals are equally weighted, then by considering the percentage of the 6 elements, the percentage of a particular element becomes equal: element repetition/ total num of elements' repetition X 100. Therefore, the core knowledge or Ability to Discover New Idea (DNI) indicator would be (element repetition/ total num of repetition X 100 = 5/20X100= 25%) of the knowledge indicator. The valuable knowledge or Characteristic of Additional Value (CAV) indicator would be (= 3/20X100= 15%) of the knowledge indicator. The applied knowledge or Prove of New Information (PNI) indicator would be (= 3/20X100= 15%) of the knowledge indicator. The profitable knowledge or Protecting of Knowledge (PK) indicator

would be (= 4/20X100= 20%) of the knowledge indicator. The recorded knowledge or Registering of Information (RI) indicator would be (= 3/20X100= 15%) of the knowledge indicator. The shared knowledge or Absolute Sharing of Information (ABI) indicator would be (= 2/20X100= 10%) of the knowledge indicator.

### *2.1.2 Quantifying the investment indicator*

To determine the percentage of each element in the investment indicator, we can refer to the business and research development system for a particular science park that is belongs to university, and match these elements to its goals as explained below. For instance, let's analyze the goals of Riyadh Techno Valley of KSU that are listed below (rtv 2011), and match them to the elements of the investment indicator.

Goals of (Rtv 2011):

- Increase the level of interaction between KSU and Saudi knowledge-based industry, business and commerce. (requires management)
- Diversify the employment opportunities for graduates and post graduates. (requires knowledge, and skills)
- Create a site that can be groomed to encourage foreign direct investment in the form of technology-based companies. (requires fund, and technology infrastructure)
- Raise the profile of KSU as modern industry and business facing centre of learning. (requires knowledge)
- Create a source of independent income from KSU from its estate and from investments in technology-Based companies. (requires fund, and management)
- Create an appropriate environment for establishing and developing a school of entrepreneurship. (requires knowledge)

By looking at the above example, we can find that knowledge is repeated 3 times, management 2 times, fund 2 times, skills and technology infrastructure one time. This can be related to percentage of the 5 elements, where the percentage of a particular element equal: element repetition/ total num of repetition X 100. Therefore, the knowledge or Metric Knowledge Investment (MKI) indicator would be (element repetition/ total num of repetition X 100 = 3/9X100= 30%) of the investment indicator, the fund or MKI indicator would be (2/9X100= 25%), the skills/experiences affects the MKI indicator by (1/9X100= 10%), the technology infrastructure affects the MKI indicator by (1/9X100= 10%), and the management affects the MKI indicator by (2/9X100= 25%).

### *2.1.3 Quantifying the business continuity indicator:*

To determine the percentage of each element in the business continuity indicator, we can refer to the business start-up or sustainable investment system for a particular investment arm that is belongs to university, and match these elements to its goals as explained below. For instance, let's analyze the goals of Riyadh Valley company of RTV that are listed below (rvc 2011), and match them to the elements of the business continuity indicator.

Goals of (Rvc 2011):

- Establishing a diversified knowledge-based investment to support the kingdom's plans towards a knowledge-based economy. (requires management & leadership)
- Transfer, settlement and development of technology to serve the national economic growth needs. (requires entrepreneurship, management & leadership, and technology infrastructure)
- Growing a solid foundation of investment assets. (requires entrepreneurship, and management & leadership)
- Establishing and growing a network of strategic partnerships & alliances to attract sources of venture and low-risk funds in support of company's initiatives and objectives. (requires management & leadership, entrepreneurship, and technology infrastructure)
- Establishing the ecosystem to attract local and international technology investments and to foster the knowledge-based industries. (requires entrepreneurship, management & leadership, and technology infrastructure)

 

- Supporting technology innovation-based start-ups through incubation services. (requires entrepreneurship, and technology infrastructure)
- Investing in the development of human capital in the domains of technology, finance and knowledge investment. (requires management & leadership)
- Increasing the adoption of innovation, IP and knowledge economy culture. (requires entrepreneurship, management & leadership, and technology infrastructure)

By looking at the above example, we can find that entrepreneurship is repeated 6 times, management & leadership 7 times, and developing technology infrastructure 5 time. This can be related to percentage of the 3 elements, where the percentage of a particular element equal: element repetition/ total num of repetition X 100. Therefore, the Entrepreneurship or Entrepreneurship Ability (EA) indicator would be (element repetition/ total num of repetition X 100 = 6/18X100= 33%) of the Business Project Continuity (BPC) indicator, the technology infrastructure or Developing the Technology Infrastructure (DTI) indicator would be (5/18X100= 28%), and the Management & Leadership Performance (MLP) indicator affects the BPC indicator by (7/18X100= 39%).

## 2.2 Key performance indicator's definitions and values

By referring to the previous section which identifies the main indictors of KBE and theirs elements as well as the values and distribution of these elements that quantify the indicators (Availability of Useful Knowledge, Metric Knowledge Investment, and Business Project Continuity), the following sub sections explain in details the relevance and effect of these elements to the creation of the identified 3 indicators. These indicators are used to measure the effectiveness of a KBE for organization as shown in next section. Each element or sub-indicator has multiple attributes, where finding the weight or value of these attributes can be defined by an expert. For simplicity, the authors in this paper assign values to these attributes associated with different sub-indicator based on their experiences and according to a study that was conducted by experts at KSU.

### *2.2.1 Availability of Useful Knowledge (AUK) (maximum KPI of 100%)*

The following indicators can be used to evaluate the availability of useful knowledge which is a key factor for building a successful Knowledge Based Economy, where AUK=ADNI+CAV+RI+PNI+PK+ASI:

**ADNI** Ability to Discover New Idea element or sub-indicator (maximum of 25% of the AUK's KPI as it has been identified in subsection 2.1.1) depends on the following attributes:

- Having wide *base knowledge,* value of 7% (base of education, level of experience of researcher or student, number of contributing to events)
- Having good *Education system,* value of 8% (curriculum, type of delivery, experience level of instructor, qualification of Instructor)
- Having good *Competition program,* value of 3% (university competition, national competition, world competition)
- Having good *Reward,* value of 3% (based on achievement and outcome)
- Gaining *experiences,* value of 4% (ability to gain experience, availability of opportunity to gain experiences)

**CAV** Characteristic Additional Value (maximum of 15% of the AUK's KPI as it has been identified in subsection 2.1.1) depends on the following attributes:

- *Quality of research,* value of 5% (ability to publish in conference and journals, internal evaluation of research)
- Ability for *innovation and creativity,* value of 4% (help and fund, innovation skills, sharing events and learn about innovation)
- Evaluated by *high standard* organization, value of 3% (evaluated by partners, evaluated by professional people, evaluated by marketing and investment professionals)
- *Sharing and partnership,* value of 3% (existing of partner with companies, existing of joint research)

**RI** Registering of Information (maximum of 15% of the AUK's KPI as it has been identified in subsection 2.1.1) that depends on the following attributes:

- *Existing of technology,* value of 3% (existing of technology hardware, software program for aided design and documentation)
- Willing for *documentation,* value of 3%
- *High technology* in laboratories, value of 5%
- Ability to *retrieve information,* value of 4% (easy to access information and publication)

**PNI** Prove of New Information (maximum of 15% of the AUK's KPI as it has been identified in subsection 2.1.1) depends on the following attributes:

- *Review* of work, value of 2% (reviewed by professional people, peer review)
- Ability to *Implement* a proof of concept, value 3% (design, pseudo code, algorithm)
- Ability to *simulate, value* of 2% (simulation software)
- Ability to *implement solution,* value of 6% (partial implementation, prototype, functional prototype, advance prototype)
- Existing of *necessary facilities,* value of 2% (equipment, lab, software)

**PK** Protecting of Knowledge (maximum of 20% of the AUK's KPI as it has been identified in subsection 2.1.1) depends on the following attributes:

- Having *IP system, value* of 5%
- Researcher's ability to produce IP, value of 10%
- *Sharing of profit, value* of 5% (partial, limited)

**ASI** Absolute Sharing of Information (maximum of 10% of the AUK's KPI as it has been identified in subsection 2.1.1) depends on the following attributes:

- Willing to share information, value of 2%
- Workshop, conference and journal publication, value of 4%
- Seminar and lecture presentation, value of 2%
- Discussion & Brain storm, value of 2%

### *2.2.2 Metrics of knowledge Investment (MKI) (maximum KPI of 100%)*

The following indicators can be used to evaluate the possibility of successful knowledge investment, where MKI=AUK+APF+EI+ARS+GMT:

**AUK** Availability of Useful Knowledge (maximum of 30% of the MKI's KPI) which can be measured as explained before.

**APF** Ability to provide Fund (maximum of 25% of the MKI's KPI as it has been identified in subsection 2.1.2) depends on the following attributes:

- Existing of *fund,* value of 10% (organization support, government support, Angel fund
- Strategy for *partnership,* value of 8% (venture capital: trust in research outcome, trust in team work, trust in project management, trust in organizational management, other party support, government legislation, investment skills, IP ownership)
- *Variety of funds,* value of 2%
- Mechanism of *acquiring fund,* value of 5% (preparation, strategy, communication

**EI** Existing Infrastructure (maximum of 10% of the MKI's KPI as it has been identified in subsection 2.1.2) depends on the following attributes:

- Services and facility, value of 3%
- Equipments, value of 5%
- Consultation and support, value of 2%

 

**ARS** Availability of Required Skills (maximum of 10% of the MKI's KPI as it has been identified in subsection 2.1.2) depends on the following attributes:

- Local *skills,* value of 3%
- Attract *new skills,* value of 4% (ability to attract, involve imported skilled people in management)
- *Legistelation,* value of 3%

**GMT** Good Management Team (maximum of 25% of the MKI's KPI as it has been identified in subsection 2.1.2) depends on the following attributes:

- *Experienced* staff, value of 10% (limited experience, academic experience, relevant experience, entrepreneurship skill)
- Ability to *learn and training,* value of 3%
- *Sharing experience,* value of 2%
- Right person for *right position,* value of 10% (accepting position for non local, advertise position, appoint through friendship, not checking qualification)

*2.2.3 Business Project Continuity (BPC) (maximum KPI of 100%)*

The following indicators can be used to evaluate the possibility of maintaining the continuity and successful business project, where BPC= EA+DTI+MLP:

**EA** Entrepreneurship Ability (maximum of 33% of the BPC's KPI as it has been identified in subsection 2.1.3) depends on the following attributes:

- *Entrepreneurship* skills, value of 18% (courage, wise, making right decision)
- *Communication* skills, value of 8% (ability to market ideas)
- Exposing to *other practices,* value of 7% (sharing of events, good listener, reading related article and news)

**DTI** Developing the Technology Infrastructure (maximum of 28% of the BPC's KPI as it has been identified in subsection 2.1.3) depends on the following attributes:

- Updated *Technology,* value of 8%
- Smart technology, value of 8%
- *Continuous Access* and Business Continuity Plan, value of 12%

**MLP** Management & Leadership Performance maximum of 39% of the BPC's KPI as it has been identified in subsection 2.1.3) depends on the following attributes:

- *Management skills* and qualification, value of 13%
- Having *right staff* with right expertise, value of 6%
- *Execution* according to plan, value of 8%
- *Monitoring* and apply right appraisal, value of 8%
- *Training* and education, value of 4%

## 3. Comparing the knowledge-based economy performance between developed and developing countries

Based on the conducted study at Riyadh Techno Valley, and the experiences of people in developed and developing countries, Table 2 presents a comparison between developed and developing countries. This comparison highlights the average performance key indicators in order to measure the availability of useful knowledge AUK. It is clear from this table that AUK in development countries is nearly one third less than developed countries. This indicates that developing countries suffer from building a proper knowledge based economy. These problems are associated with their average education system, low research capability, improper review process, and average Intellectual Properties outcomes. As shown also in Figure 2, developing countries suffer from very low KPIs of base knowledge, ability to produce IP, implement solution and creativity.

In Table 3, a comparison between developed and developing countries based on the average metric of knowledge investment MKI performance indicator is presented. It is clear from this table that low AUK in developing countries as well as problems in providing enough variety funding for technological projects, not completing the technology infrastructure, and inadequate management experiences in these countries would lead to an average indicator for investment in the knowledge based projects. As shown also in Figure 3, developing countries suffer from very low KPIs of variety of funds, legislation, mechanism of acquiring funds, partnership strategy and experienced staffs in addition to the low KPI of the Availability of Useful Knowledge AUK.

In Table 4, a comparison between developed and developing countries based on the Business Continuity Performance (BPC) indicator is presented. It is clear from this table that low value of management & leadership performance, as well as entrepreneurship ability are the main causes for lowering the BPC indicator in developing countries. Where the lack of management skills, and auditing as well as not appointing of relevant people for the right position in developing countries which are common makes the BPC indicator to be low. In addition of slowing the process of implementing the technology infrastructure, it would cause more lowering of BPC indicator for some countries.

**Table 2**: Average performance key indicators for the Availability of Useful Knowledge (AUK) at developed versus developing countries (maximum KPI of 100%)

| Type of PKI | | Developed Countries | Developing Countries |
|---|---|---|---|
| Ability to Discover New Idea ADNI (max 25%) | Base knowledge 7% | 7 | 4 |
| | Education system 8% | 7 | 5 |
| | Competition program 3% | 3 | 2 |
| | Reward 3% | 2 | 1 |
| | Experiences 4% | 4 | 2 |
| Characteristic Additional Value CAV (max 15%) | Research quality 5% | 5 | 2 |
| | Creativity 4% | 4 | 1 |
| | High standard 3% | 2 | 2 |
| | Sharing, partnership 3% | 2 | 1 |
| Registering of Information RI (max 15%) | Existing technology 3% | 3 | 3 |
| | Documentation 3% | 3 | 1 |
| | Retrieve information 4% | 4 | 3 |
| | High technology in laboratories 5% | 5 | 3 |
| Prove of New Information PNI (max 15%) | Review process 2% | 2 | 1 |
| | Proof of concept 3% | 3 | 3 |
| | Simulation 2% | 2 | 1 |
| | Implement solution 6% | 5 | 2 |
| | Necessary facilities 2% | 2 | 1 |
| Protecting of Knowledge PK (max 20%) | Intellectual Properties 5% | 5 | 3 |
| | Sharing profit 5% | 4 | 5 |
| | Ability to produce IP 10% | 9 | 3 |
| Absolute of sharing Information ASI (max 10%) | Share information 2% | 2 | 2 |
| | Knowledge Events 4% | 3 | 3 |
| | Presentation 2% | 2 | 1 |
| | Brain storm 2% | 2 | 1 |
| Total | | 92 | 56 |

**Table 3**: Average performance key indicators for the Metric Knowledge Investment MKI at developed versus developing countries (maximum MKI of 100%)

| Type of MKI | | Developed Countries | Developing Countries |
|---|---|---|---|
| **AUK** Availability of Useful Knowledge (max 30%) | | 92*0.3=27.6 | 56*0.3=16.8 |
| **APF** Ability to provide Fund (max 25%) | Existing of fund 10% | 9 | 7 |
| | Partnership Strategy 8% | 8 | 4 |
| | Variety of funds 2% | 2 | 0.4 |

 

| | | | |
|---|---|---|---|
| | Mechanism of acquiring fund 5% | 5 | 2 |
| Type of MKI | | Developed Countries | Developing Countries |
| **EI** Existing Infrastructure (max 10%) | Services and facility 3% | 3 | 2 |
| | Equipments 5% | 4 | 4 |
| | Consultation and support 2% | 2 | 1 |
| **ARS** Availability of Required Skills (max 10%) | Local skills 3% | 3 | 1 |
| | Attract new skills 4% | 3 | 2 |
| | legist elation 3% | 3 | 1.3 |
| **GMT** Good Management Team (max 25%) | Experienced staff 10% | 9 | 5 |
| | Ability to learn and training 3% | 3 | 2 |
| | Sharing experience 2% | 2 | 1 |
| | Right person for right position 10% | 9 | 6 |
| Total | | 92.6 | 55.7 |

**Table 4**: Average performance key indicators for the BPC at developed versus developing countries (maximum BPC of 100%)

| Type of BPC | | Developed Countries | Developing Countries |
|---|---|---|---|
| **EA** Entrepreneurship Ability (max 33%) | Entrepreneurship skills 18% | 16 | 10 |
| | Communication skills 8 % | 8 | 4 |
| | Exposing to other practices 7 % | 5 | 5 |
| **DTI** Developing the Technology Infrastructure (max 28%) | Updated Technology 8% | 8 | 7 |
| | Smart technology 8% | 5 | 3 |
| | Business Continuity Plan 12% | 7 | 7 |
| **MLP** Management & Leadership Performance (max 39%) | Management skills, qualification 13% | 11 | 4 |
| | Training and education 4% | 4 | 2 |
| | Execution according to plan 8% | 8 | 2 |
| | Monitoring and apply right appraisal 8% | 5 | 2 |
| | Having right staff with right expertise 6% | 5 | 3 |
| Total | | 82 | 49 |

## 4. Partnership and Venture Capital (VC) project funding in KSA

In order to identify the problems facing the technological entrepreneurship projects at KSA, a survey has been conducted through contacting companies' managers in Saudi Arabia as shown in Figure 4. According to this survey, the most critical obstacles facing the VC project funding are related to lack of skills (61%), education programs (54%), research capability (51%), and management (37%), which all contributes to lowering the trust among investors and funders. There are other obstacles associated with funding constraints that are caused by the lack of knowledge and good incentive program to attract partners through a fair partnership models. There are some other obstacles associated with acquiring knowledge, existing regulations and confusing procedures and company processes. These results give an indication to the main obstacles facing the development countries, where skills, experiences and knowledge are the main factors in slowing down the creation of knowledge based economy compared to the existence of funding. This will reduce the trust among VC organizations to involve in the partnership and to support the development of technological projects.

## 5. Conclusion

The concept of knowledge management has been presented, where it shows the importance of effective knowledge sharing using latest technologies and successful collaborative platform strategies. In addition to determining the organization's readiness not only to implement KM, but also its readiness to be truly a knowledge-based, knowledge driven organization. Unlike the descriptive approach used for checking the organization's readiness to identify the gap and try to fill in this gap, a better method using analytical approach has been suggested in this paper. Where, a new method for measuring the effectiveness of national knowledge-based economy has been presented, and is based on quantitative analytical approach. It uses different performance indicators that are associated with the availability of knowledge, the knowledge investment and business project continuity. A comparison between developed and development countries has shown relatively low or average performance indicators, as compared with that of the developed countries, which is due to problems in their education system, average research capabilities and Intellectual Properties, low projects funding and lack of management experiences. The VC funding in development country at Saudi Arabia has been analyzed and the indications has shown a lack of trust in innovation caused by the low level of innovation skills and problems in education programs and management, in addition to other obstacles associated with the regulations and the internal process.

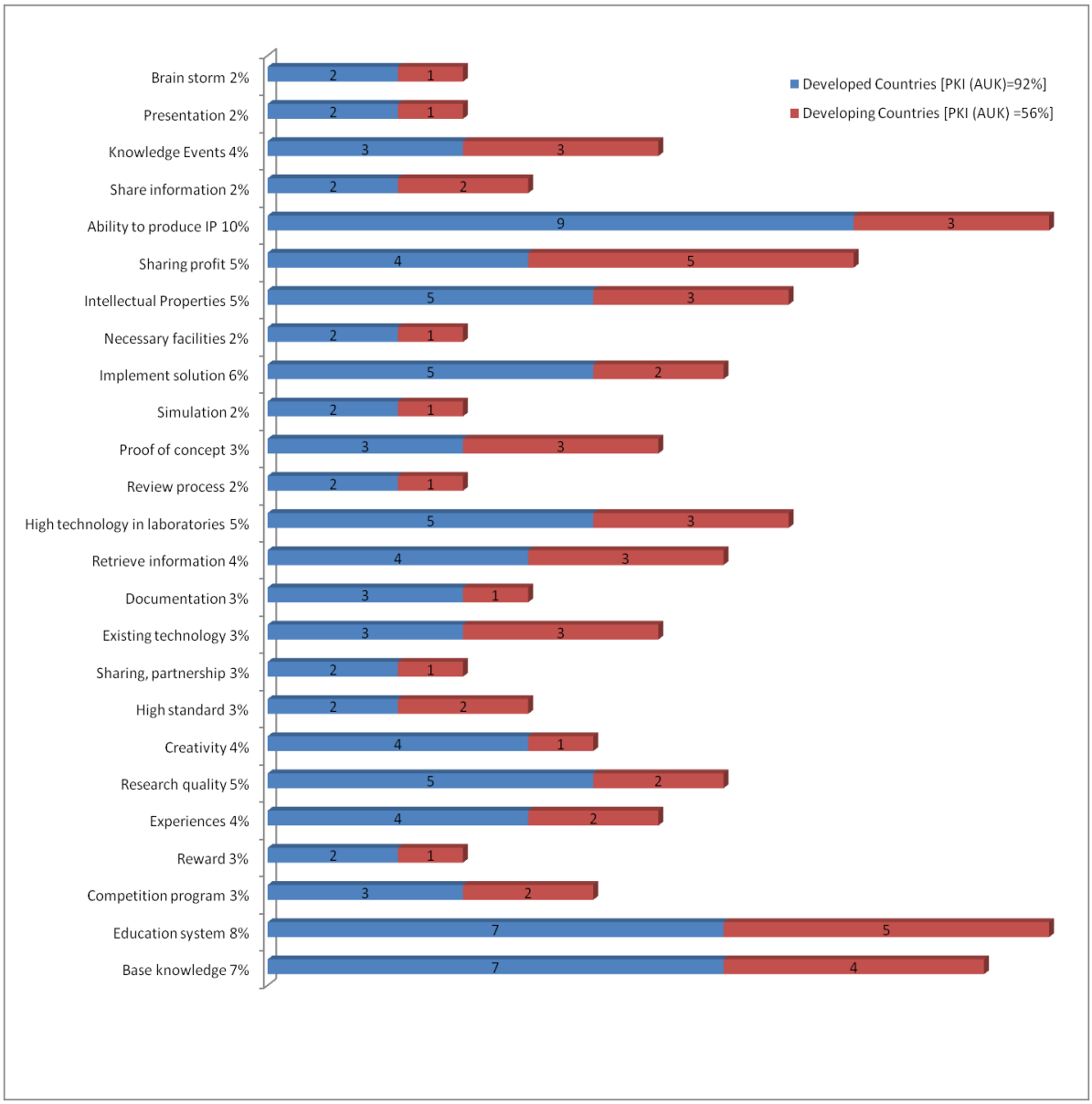


**Figure 2**: Key Performance Indicator (KPI) of the Availability of Useful Knowledge (AUK) at develped and development countries

 

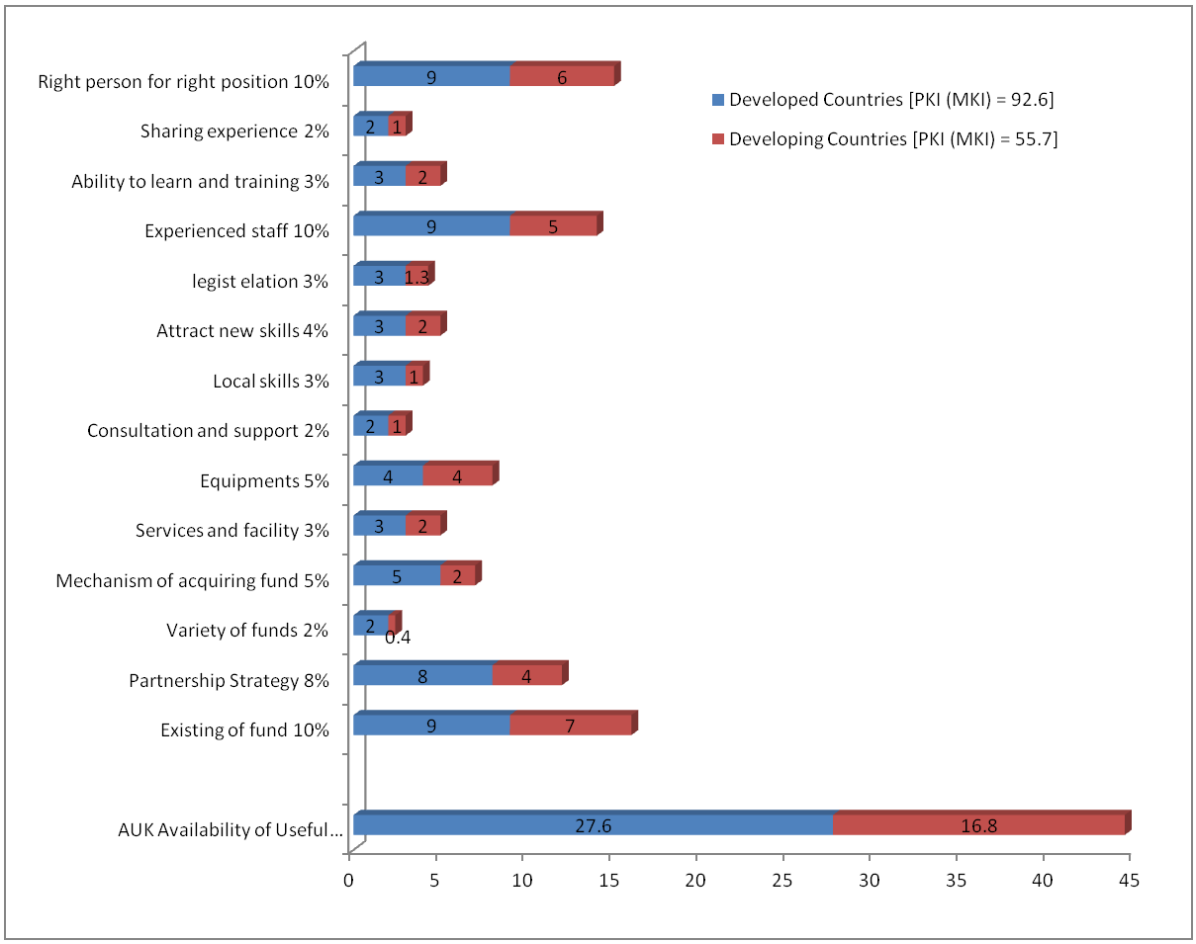


**Figure 3**: Key Performance Indicator (KPI) of the Metric Knowledge Investment MKI at develped and developing countries

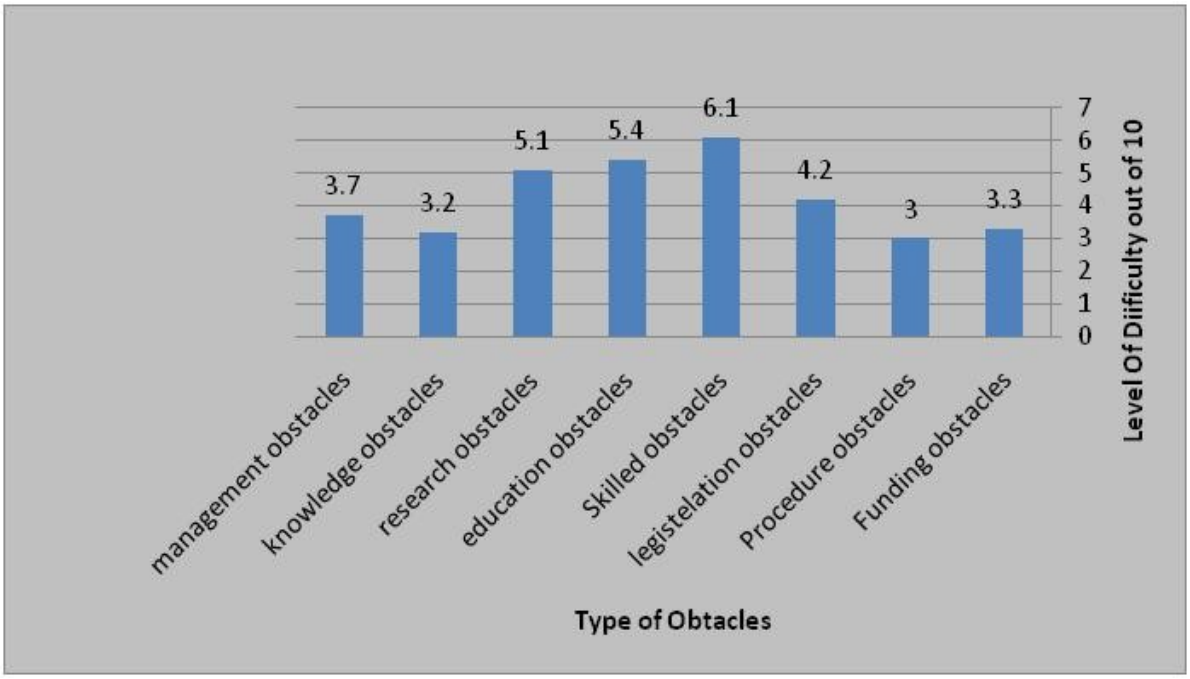


**Figure 4:** Obstacles and difficulties facing technological entrepreneurship projects at KSA

## Acknowledgments

The authors would like to give a good appreciation to Dr Shady Aly at RTV for proof reading this paper.

## References

Bellinger, G bel97a, (2004) "Knowledge Management—Emerging Perspectives", [online], Available: http://www.systems-thinking.org/kmgmt/kmgmt.htm [10 Dec 2011].

Blackwell (2002), "Assessing WLAN Security Threats", [online],http://www.80211planet.com/tutorials/article/04000,10724_95348100.html [10 Dec 2011].

David Paul A. & Foray Dominique (2003), Economic Fundamentals of the knowledge Society Policy Futures in Education, Volume 1.

Freel, M. (2000) "External linkages and product innovation in small manufacturing firms", *Entrepreneurship and Regional Development*, 12, 245-266

Geier Jim, (2002),"Assigning 802.11b Access Point Channels", [online], http://www.80211planet.com/tutorials/article/0,4000,10724_972261,00.html [10 Dec 2011].

Gibb, A. (1995) "Learning skills for all: The key to success in small business development", ICSB Annual Conference Proceedings, 1-21.

Hylton Ann, (2008) "A Readiness Assessment is Essential in a KM and Knowledge AUDIT Initiative", [online], http://hosteddocs.ittoolbox.com/ah100708.pdf [10 Dec 2011].

Info.Worldbank, (2009), http://info.worldbank.org/etools/kam2/KAM_page5.asp [10 Dec 2011].

Kbar G., Ubeida W.S (2005) "Wireless Network as solution for efficient distribution of Knowledge Management, ICICKM 2nd International Conference on Intellectual Capital Knowledge Management and Organizational Learning, AUD-Dubai

Kbar G, (2011), Fair Partnership Model by Sharing the Benefit of Knowledge Creation， ECIME the 5th European Conference on Information Management and Evaluation, Como, Italy

Ksu, (2011), http://www.ksu.edu.sa/Pages/default.aspx [10 Dec 2011].

Molta Dave, (2002), "WLAN Security on the Rise", [online],http://www.networkcomputing.com/1303/1303ws2.html [10 Dec 2011].

nGenera Insight (2010), "Enabling Collaborative Platform Adoption", [online], http://www.moxiesoft.com [10 Dec 2011].

Nortel, (2001), "IEEE 802.11 Standard For Wireless LANs", [online], http://www.nortelnetworks.com/solutions/financial/collateral/mar00_wireless.pdf [10 Dec 2011].

Phife Lisa (2001), "Wireless Privacy: An Oxymoron", [online], http://www.wi-fiplanet.com/columns/article/0,4000,1781_786641,00.html [10 Dec 2011].

Rothwell R. (1991),"External networking and innovation in small and medium size manufacturing firms in Europe", *Technovation*, 11(2). pp. 93-112.

Rtv, (2011), http://www.rtv.com.sa, [10 Dec 2011].

Rvc, (2011), http://www.rvc.com.sa/Default.aspx [10 Dec 2011].

Schenk Rob, (2001), "Wireless LAN Deployment and Security basics network", [online], http://www.extremetech.com/article/0,3396,s%253D1034%2526a%253D13521,00.asp [10 Dec 2011].

Signa Services (2001), "Best Practices for Deploying Wireless LANs", [online], Planet, http://www.wi-fiplanet.com/tutorials/print/0,,10724_985421,00.html [10 Dec 2011].

Schwartau, (2001), "How to Break Into a Network with Only Three Keystrokes", [online], http://searchsoa.techtarget.com/news/770991/How-to-Break-Into-a-Network-with-Only-Three-Keystrokes [10 Dec 2011].

Zaheer, A. and Bell, G.G.(2005) "Benefits from network position: Firm capabilities, structural holes and performance", Strategic Management Journal, 26, 809-825.

Wilkinson, F., Lawson, C, Keeble, D., Lawton-Smith, H. and Moore, B. (1996) "Innovative behaviour of technology-based SMEs", joint CBR/Warwick SME Centre conference on innovation in small firms, University of Cambridge, Cambridge.

Worldbank,(2011),http://web.worldbank.org/WBSITE/EXTERNAL/WBI/WBIPROGRAMS/KFDLP/EXTUNIKAM/0,,menuPK:1414738~pagePK:64168427~piPK:64168435~theSitePK:1414721,00.html [10 Dec 2011].

 