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# Developing Intellectual Capital to Advance Innovation and Entrepreneurial Capacity and Sustain Knowledge Economy

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***Abstract*—**Both knowledge economy and sustainable development are considered key dimensions in the policy action lines of many developed and developing countries. In this context, universities and other higher education institutes have a vital role in developing and sustaining wellbeing communities.

In this paper, the authors' aim is to address the links between the concepts of innovation and entrepreneurial capacity and knowledge economy, and to utilize the approach of intellectual capital development in building a sustainable knowledge economy.

The paper will contribute to two discourses:

(1) Developing a common understanding of the intersection aspects between the three concepts: Knowledge economy, Innovation and entrepreneurial system, and sustainable development.
(2) Paving the road towards developing an integrated multidimensional framework for sustainable knowledge economy.

***Keywords*—**Innovation and Entrepreneurial Capacity, Intellectual Capital Development, Sustainable Development, Sustainable Knowledge Economy.

## I. Introduction

THE term knowledge economy, coined by the OECD in the 1990's, defined a type of economy which was "directly based on the production, distribution and use of knowledge and information" [1]. However, in 2001, the uneven rate of growth in several OECD economies was attributed not to knowledge production and distribution but to investment in ICTs, investment in human resources development and investment in business innovations [2]. These statistics raise the question of the validity of the OECD definition and the importance of addressing the sustainability dimension in the concept of knowledge economy.

The main aim of this study is to address the links between the concepts of innovation and entrepreneurial capacity and knowledge economy, and to utilize the approach of intellectual capital development in building sustainable knowledge economy. Towards achieving this aim, the study is intended to formulise common understanding of the aspects at the intersection between the three concepts: Knowledge economy, Innovation and entrepreneurial system, and sustainable development. The second objective of the study is to define the main elements of intellectual capital which should contribute in advancing and maintaining innovation and entrepreneurial capacity and sustaining knowledge economy.

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## II. Toward Developing Multi-Dimensional Framework for Sustainable Knowledge Economy

The concept of knowledge economy has shared some important aspects with the concepts of innovation and entrepreneurship as well as the concept of sustainable development (see Fig. 1). Considering that this series of studies are aiming to develop in later stages a multi-dimensional framework for knowledge economy characterized by sustainability, we are, therefore, planning to examine and analyse the links and relationships between the three concepts and their associated frameworks. The aim of the analysis is to utilize the strengths and overcome the limitations in the development of the proposed framework.

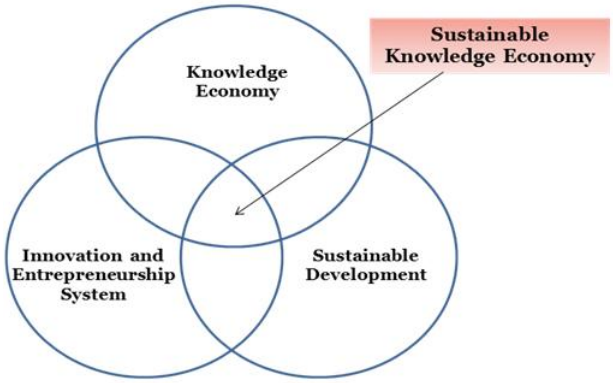



Fig. 1 Conceptual Model for Sustainable Knowledge Economy

## III. The Role of Knowledge in Growth and Economic Development

Many theories and approaches have been proposed to explain the role of knowledge and technologies in growth and economic development. The most important are: Endogenous Growth Theories, Schumpeterian Approach, and The Evolutionary Approach. These theories and approaches were used as bases for several economic development models and frameworks. Such use was intended to overcome the

limitations of classical economic theories and approaches and to minimize the social and environmental negative impact of economic growth [3], [4]. Table I highlights the main features of these theories and approaches.

TABLE I
SUMMARISE THE MAIN FEATURES OF ENDOGENOUS GROWTH THEORIES, SCHUMPETERIAN AND EVOLUTIONARY APPROACHES

| THEORIES AND APPROACHES | FEATURES AND CHARACTERISTICS | REFERENCES |
|---|---|---|
| Endogenous Growth Theories | • Modelling the process of innovation.<br>• Dealing with knowledge as a product<br>• Uses Standard Neoclassical General Equilibrium Models in the processes of generating, analysing distributing and using Knowledge.<br>• The growth is a result of knowledge and technology accumulation and required continuous investments in research and development.<br>• Based on the Creative Destruction Theory. | [3] Aghion and Howitt, 1992<br>[5] Griliches, 1992<br>[6] Grossman and Helpman, 1991<br>[7] Romer, 1990<br>[8] Kopf, 2007 |
| Schumpeterian Approach | • It is the process of economic sectors mutation (transformation at the macro level) that incessantly revolutionizes the economic system from within, incessantly destroying the old one, incessantly creating a new one.<br>• The economic evolution of the routine system consists in a series of routine equilibrium and innovative disturbances.<br>• Two factors are responsible for driving economic growth, the role of entrepreneurs and the role of large companies and enterprises. | [9] Andersen, 2004<br>[10] Arena and Dangel-Hagnauer, 2002<br>[11] Schumpeter, 1942 |
| Evolutionary Theories | • The knowledge which has potentially economic value does not distributed from sector to sector in a Linear Manner<br>• Innovation has to be considered as holistic system.<br>• Innovation is the key driver for growth and central mechanism for economic change<br>• Re-structuring of economic system is essential for economic growth<br>• Innovation trends has to respond to the market changes<br>• The economic system has to diversify its inputs and increase its capacity to accommodate new innovations. | [12] Ancori, et al., 2000<br>[13] Cowan, et al., 2000<br>[14] Davenport and Prusak, 1998<br>[15] Kanter, 1999<br>[16] Laudon and Laudon, 2000<br>[17] Metcalfe, 2007 |

## IV. KNOWLEDGE ECONOMY VS INNOVATION AND ENTREPRENEURSHIP SYSTEM

The relation between the concept of knowledge economy and the concept of innovation system is vital in the evolution and development of both concepts and a base for debate between two different schools of thoughts. Godin [18] has pointed out that knowledge economy concept is an extension and re-conceptualization of the concept of innovation system, as the researchers in the field of innovation systems were divided into two groups. The first group has adopted more practical approach focusing mainly on analysing components of the innovation system and how they are developed and organized to suit specific contexts in an organizational or national level. The second group has adopted a theoretical approach focusing on the knowledge and how it is relatable to the process of learning; learning by doing and learning by using. The second school is responsible for the re-emerging of knowledge economy.

The search for a new term that has been accomplished with the emergence of knowledge economy was driven by many factors [18]-[20]. The first factor is related to the challenges of linking and integrating innovation systems with the development of organizational and national policies. These challenges are associated to a certain extent to the practicality of existing innovation system models and their limited impact in practice. The second factor is the need for a new term which firstly, stresses the importance of knowledge production and distribution on increasing the capacity of innovation, secondly, addresses the impact of science and technology on growth and development, and thirdly, has more influence on decision makers.

## V. UTILIZING INTELLECTUAL CAPITAL DEVELOPMENT FOR SUSTAINABLE KNOWLEDGE ECONOMY

As we mentioned earlier, the concept of knowledge economy has shared some important aspects with both the sustainable development concept and the innovation concept. The concept of sustainable development can be seen according to the World Commission on Environment and Development [21] as a change process in which the available resources are used and treated wisely and fairly, investments, organizations structures and technological advances are exploited and directed in a balanced manner towards serving the needs of the present without compromising the ability of future generations to meet their own needs.

With the advent of the global economic crisis in the first decade of this century, the concept of sustainable development gained more momentum as a possible solution to the crisis. As a result of this, the concept has been adopted by nations, regions, and organizations using different models and frameworks [22], [23]. Addressing the sustainability dimension in knowledge-based economy initiatives cannot be achieved through the use of existing frameworks of knowledge economy. The current experiences have shown that most of the world countries and institutions are, despite their efforts in searching for new ideas to enable them to maintain growth and excellence; failing to sustain the front positions in the knowledge economy indexes.

Utilizing the capital concept is considered as an important approach in developing sustainable development frameworks and dealing with sustainability concerns. This approach and the components of its associated frameworks have the potential to address the sustainability dimension within a new integrated multidimensional framework for sustainable

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knowledge economy.

One of the sustainability models that utilize the capital concept in its structure is the capital stock model. This model has been developed by a study group of The World Bank in 1994. The model is based on a basic idea of considering the interests of all stakeholders, and not only by the interest of selected stakeholders, as well as achieving a balance between the different types of capitals, the environment, the economic, and the social capitals [24].

Elliott [25] has provided a different model, breaking down the capital into three broad types: natural capital, human capital, and created capital. Natural capital includes the stock of all environmental and natural resources and this is used as input into production [26]. Human capital comprises skills, experience, and knowledge that skilled and educated people have and use to operate and improve the production process [27]. Created capital includes the traditional classification of capital as machines and already-produced durable goods that are created by the people to aid in the production of final goods and services [25]. According to OECD [2], sustainable economic development has to focus on gaining and increasing the stock of created capital with the minimal use of other capital stocks. This view is supported by Elliott [25]; he is arguing that sustainable economic development is dependent on how the three types of capital are mapped and deployed in an economic sustainability strategy.

The use of the capital concept in an integrated multidimensional framework for sustainable knowledge economy requires re-thinking and expanding the types and the components of existing capital models. As defined by existing models, human capital, for example, does not provide a valuable addition to a new framework for sustainable knowledge economy. In this regard, the broad range list of components provided by Sucin & Bratescu [28] can be very useful in defining human capital. The list contains; Know How, Innovativeness, Qualification, Proactive and Reactive Abilities, and Changeability.

Perhaps the most important type of capital which can be regarded as a valuable addition to a new framework for sustainable knowledge economy is the Intellectual Capital. In this case, Intellectual Capital can be either considered as a separate component or can be combined with human capital wherein human capital is considered part of it. Stewart [29] has indicated that the term intellectual capital has been used more often as a synonym for the term of Intangible Assets, as well as the term Knowledge Assets.

Edvinsson and Malon [30] have provided a unique model for intellectual capital which divided the Intellectual Capital into two parts. The first part follows the human capital and is represented by the knowledge assets produced and stored at the institution, region or state level. The second part follows the Structural Capital, and is represented by the Infrastructure in place to support the human capital. The Structural Capital then divided as well into two parts. The first part, called Organization Capital, is represented by the knowledge produced and stored in the information systems. The second part, called the Customer Capital, is represented by the value of the links and relationships between the institution and beyond. Fig. 2 provides an outline for intellectual capital components; the outline is adapted from Edvinsson and Malon model with the required changes to some of terms to suit sustainable knowledge economy context. Research studies show that there is a disparity and a difference in what could be classified as a component of intellectual capital, Table II offers a list of the most important components that could be included under the term intellectual capital.

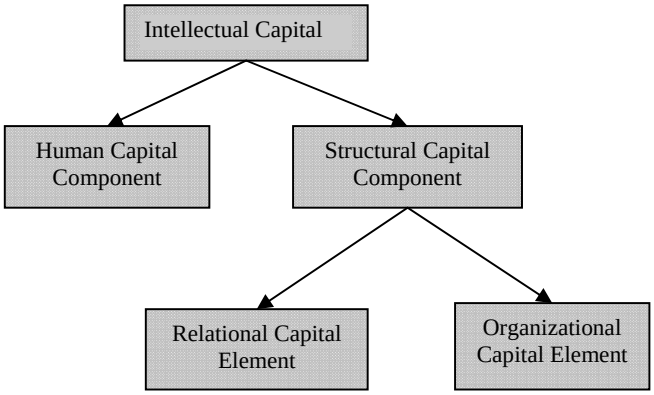



Fig. 2 An outline for Intellectual Capital Components

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TABLE II
PROPOSED COMPONENTS LIST FOR INTELLECTUAL CAPITAL

| Intellectual Capital Components | Intellectual Capital Elements | Intellectual Capital Factors | References |
|---|---|---|---|
| Human Capital Component | | Creativity and Innovation Capability | [31] Bontis (2000)<br>[32] Chen et al. (2006)<br>[33] Lynn (1998)<br>[34] Subramaniam and Youndt (2005) |
| | | Educational Qualification | [33] Lynn (1998) |
| | | Applied Experience | [35] Edvinsson (1997)<br>[36] Kaufmann & chneider (2004) |
| | | Professional Skills | [35] Edvinsson (1997) |
| | | Entrepreneurial and Managerial Skills | [31] Bontis (2000)<br>[37] Marvel and Lumpkin (2007) |
| Structural Capital Component | Organizational Capital Element | Leadership and Management Philosophy | [33] Lynn (1998) |
| | | Intellectual Property | [33] Lynn (1998)<br>[35] Edvinsson (1997)<br>[36] Kaufmann & chneider (2004)<br>[38] Stewart (1997) |
| | | Information Systems | [33] Lynn (1998)<br>[39] Rahman (2012) |
| | | Knowledge Bases | [33] Lynn (1998)<br>[40] Bontis (1999) |
| | | Expert Networks and Teams | [33] Lynn (1998) |
| | Relational Capital Element | Networking Systems | [41] Reed et al. (2006)<br>[42] Hsu and Fang (2009) |
| | | Customer Relationships | [35] Edvinsson (1997) |
| | | External Agents Relationships | [42] Hsu and Fang (2009)<br>[43] Un et al. (2010) |
| | | Business External Collaborations | [41] Reed et al. (2006)<br>[42] Hsu and Fang (2009) |

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