

воздействия отклонений плановых состояний проектов от текущих с учетом классифицированных состояний и принадлежности проектов к определенным классам, что позволит формировать управляющие воздействия на основе отклонений проектов от планов с учетом опыта выполнения успешных проектов.

Дальнейшие исследования целесообразно проводить в направлении экспериментальной проверки работоспособности полученных теоретических результатов.

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MULTI-METRIC DEFINITION OF KNOWLEDGE ECONOMY

The modern economy is characterized by high investments in intangible assets (knowledge, information, ICT, and technology) as its main activity driver. A new definition of modern economy as knowledge economy is generated using a multi-metric table of modern economy activity drivers. Model of activity drivers in knowledge economy is also created. Studies have shown that all players in modern economy require both explicit and tacit knowledge to achieve economic success and competitive economic advantage. Fig. 1, tabl. 1, ref. 18.

Key words: modern economy, knowledge economy, globalization, industrialization, information and communication technology, activity driver, innovation

INTRODUCTION

Problem statement in a general view. The growing globalization coupled with economic competition among countries, international organizations, and the complex and dynamic globalized environments of modern economy require economies and companies to adjust to the changes in the modern economy. The biggest challenge is to identify those drivers that are causing the rapid changes in the modern economy

(i.e. knowledge economy), and to also provide a multi-metric definition of knowledge economy to capture all these drivers which all the players in the game need to stay updated with. Operating in a modern economy driven by knowledge, information, research and development, technology, information communication technology (ICT), education, and advanced innovation after the global financial crises of 2007/8 has necessitated the need for companies and economies to identify and pay critical attention to these drivers to be able to curtail the varied knowledge-based modern economic challenges in order to gain competitive advantage.

The development processes of modern economies and companies are becoming increasingly central to Knowledge. Countries are relying heavily on Knowledge as part of their development strategies, most especially those countries operating in modern economies like China and India who rely heavily on creativity, innovation and knowledge – based technology as a source of sustainable growth and jobs creation [1]. Undeniably, each of these countries face multiple challenges –from identifying the key activity drivers in the knowledge economy, applicable tools to ensure gaining competitive advantage and the knowledge economic system model which support economic growth and development.

Most national economies and organizations in their own contexts respond to the economic challenges as a form of usual routine difficulties and attempt to handle it in their own way. Although these challenges may be important economic indicators for decision making, it is one of the many reasons why most economies want to develop their entire economy based on knowledge. For instance, transformative economies like US and Canada have largely been associated to the extensive application of knowledge tools (such as technology, education, science, research, and innovation) which drives the economy [2]. Many countries have already embraced the Knowledge Economy concept, and some are already taking strides in that direction.

The concept of knowledge economy is characterized with the generation and adoption of new knowledge created by scientific research, technological development, investments in intangible assets, adoption of best practices, and openness to socio-economic, and cultural innovations [3]. These features and other indicators are why some scholars refer to the modern economy as: network, project, service, globalized, informational, innovative economy, etc. [4, 5]. These have necessitated for a multi-metric definition of knowledge economy to be defined to clarify that all such terms are some of the indicators of knowledge economy.

Actuality of the study: The rapid changes in the modern economy have necessitated the identification and a multi-metric definition of the activity drivers of the modern economy to ensure economic growth and development. The advanced innovation which has dominated the modern economy characterized by high level technology and ICT is pure application of knowledge. The study uses multi-metric table and model of activity drivers of the modern economy to highlight the main activity drivers of knowledge economy, and also indicates the major drivers of knowledge economy that need to be given rapt attention by economies and companies in order to gain competitive economic advantage. Furthermore the study presents useful information based on metric table and model to support the already existing scholarly knowledge and recommend a further research is conducted on defining knowledge economy.

Analysis of the last researches including attempts to solve the problem, highlighting of its unsolved part. Studies into the modern economy have revealed the role of knowledge in ensuring economic growth. In the global knowledge economy of the twenty-first century, National development policy challenges will require it to use knowledge more effectively to raise productivity in all sectors of the economy ranging from agriculture, industry, and services. Studies have revealed that the rapid pace of

economic growth in China has been exceptional since it introduced economic reforms in late 1970s. China's economy has earned higher incomes and made the largest single contribution to global poverty reduction. Such gains are remarkable and have been largely attributed to effective adoption and application of various knowledge and technologies such as ICT, innovation, research, education and technology [6].

Some studies explained knowledge economy as a well-established culture of valuing knowledge. That is, using knowledge assets - human resources, education systems, researches and entrepreneurship has a potential for economic growth and income in areas where knowledge drives the economy, particularly in terms of improving and developing infrastructure for information and communications technology [7]. Also another study clarified knowledge economy as where knowledge is at the heart of value added, ranging from high technology manufacturing, information and communication technology through knowledge intensive services to the explicitly creative industries such as media and architecture is termed as knowledge economy [8]. Furthermore, Knowledge economy has been defined by some scholars as where production and services are based on knowledge-intensive activities that contribute to an accelerated pace of technical, scientific advances as well as rapid obsolescence [9].

Further studies have highlighted knowledge economy for its greater reliance on intellectual capabilities than on physical inputs or natural resources which are limited and depreciate with time and state that unlike other resources knowledge appreciates as ones experiences, education and level of skills increase.

Also another study attributed knowledge as the main driver of the high level of increased globalization, accelerated and speedy distribution and transfer of information and telecommunication technologies, which have had greater impact on the development of countries, regions, corporations, individuals' lives and public institutions.

The unsolved part of the general problem: Aim of the article. Unfortunately most scientific researches in the academia have not committed much effort to providing an all-inclusive multi-metric definition of knowledge economy to capture all the major activity drivers of knowledge economy. Also, diminutive attempts have been made by researchers to develop a generalized multi-metric table that gives a comprehensive explanation of knowledge economy in order to give it a clearer understanding. More so, there is no standardized multi- metric table that clearly states all the major elements of knowledge economy – innovation, information and communication technology, intellectual resource, and research and development. Furthermore the elements of knowledge economy have not been properly connected in a standardized multi-metric form, making the understanding of each element not clearly explained in defined terms. The above points have demanded a study to be conducted on this topic.

This article's aims among other things are to develop a knowledge-based and all-inclusive multi-metric definition of knowledge economy, and to highlights the major elements which are common in the already existing definitions of knowledge economy. Also the aim is to develop model of knowledge economy activity driver which includes the entire major identified elements in the definitions of knowledge economy, establish their interconnectivity, and the role each element play in ensuring economic development and economic activity continuity.

MAIN FINDINGS

Basic part of the research: After an in-depth analysis and thoroughly reading most of the scholarly definitions of what 'knowledge economy' really is, I identify these metrics as the key elements in all the existing scholarly definitions of knowledge economy: knowledge, information, innovation, tools (such as technology, education,

science, and research), information communication technology (ICT), and economic systems.

Knowledge, this study identified knowledge as the ideas or understandings which an entity possesses that are used to take effective action to achieve the entity's goal(s). Knowledge is the sum of what is known and resides in the intelligence and the competence of people. The knowledge is specific to the entity which created it, and knowledge economies are those that the production, distribution and use of technology, knowledge and information drive the entire economy [10]. As a matter of fact knowledge is now becoming the one factor of production, sidelining capital, land and labor. In recent years, knowledge has come to be recognized as a factor of production in its own right, and it's distinct from labor.

Information is another key element in defining knowledge economy, information is a set of significant signs that has the ability to create knowledge. The significance of information manifestation has been well-thought-out as the incidence of a communication process that takes place between the sender and the recipient of the message. Thus, the various concepts of information tend to focus on the origin and the end point of the process is communication.

The modern economy highlights that efficient production relies on information and know-how; over 70 per cent of workers in developed economies are information workers; many factory workers use their heads (intellects) more than their hands [11]. Knowledge and information now drive the creation/generation and exploitation of wealth of a nation.

Information and Communication Technology (ICT) is also a basic term identified in most scholarly definitions of knowledge economy. ICT covers all forms of Computers and Communications equipment as well as the software used to create, store, transmit, receive, interpret, and manipulate information in its various formats [12]. The rapid development and adoption of information and communication technologies (ICT) is one major characteristic of modern economy.

Typical with the past economies is the several years it took to build the fixed-line telecommunications system. Surprisingly, in a couple of decades, the number of mobile telephones worldwide has grown drastically and now exceeds that of fixed-line connections. This has saved economies from the economic costs of digging up most of the streets in the cities to install telephone cables. ICT has brought about global connectivity, this has made economic activities become easier and cost effective than before. Artificial intelligence and intelligence agents also play a major role in the modern economy. The artificial intelligence service rely heavily on knowledge as its main source of input to create intelligence machines such as computers, Google's self-driving car, email spam filter, google translate, robotics devices etc. which currently dominate the modern economy. [13] All these also prove how ICT and technology is fast forwarding economic growth.

Innovation and tools are also identified common metric in the various definitions of knowledge economy. Innovation may be explain as the process of making changes, large and small, radical and incremental, to products, processes, and services that result in the introduction of something new for the organizations that adds value to customers and contributes to the knowledge store of the organization [14]. Knowledge economy is based upon the creation of innovative knowledge by scientific research and technological improvement. The modern economy uses education and research as one of the means for knowledge creation and extraction. It must be noted that access to this knowledge is the most important condition for the successful transformation of economic and social support for economic growth. Studies have established that research and educational investments are the basic inputs of knowledge economy.

Modern economies such as China always foster creativity and innovation within all sectors of the economy, though creativity and innovation is the principal challenge of most emerging economies in the 21st century. Innovation and research is characterized by uncovering new market opportunities through identifying the value potential in existing operations and adapting them to generate new business or enhance existing business.[15,16] Successful innovation is often simple and understandable. Innovation basically is not difficult and does not have to be perceived as entailing high risk. A successful innovation is usually a response to a market need identified by a market player(s).

An *economic system* is principal among all the key metric terms in the existing definitions of knowledge economy. Economic system is the way a country's resources are owned and the way that country takes decisions as to what to produce, how much to produce and how to distribute what has been produced.

The economic systems of a country serve as concepts for understanding the various transitional periods, dynamics and the overlapping nature of the various stages and changes of the economy to ensure continuous innovation and the application of knowledge. A typical knowledge-based economy comprises of three stages of development: the resource-driven, investment-driven, and knowledge or innovation-driven stages. [17, 18].

From the above explanations of the key metric terms in the existing scholarly definition of knowledge economy, this research presents below the multi-metric comprehensive definition of knowledge economy (table 1). This definition is multi-metric because it captures all the key metric terms that need to be present in other to give a comprehensive definition of knowledge economy. The above metrics table considered the main activity drivers and innovation policies of knowledge economy, and provides a comprehensive and uniform definition of what knowledge economy entails. It captures all the key terms that have been used by various scholars to define knowledge economy.

The identification of the main activity driver of knowledge economy has highlighted the distinguishing features of the various economic evolutions over the past decades.

Table 1
Multi-metric tabular definition of knowledge economy

Contextual capacity in definition		Contextual capacity
Term		Knowledge Economy is:
Activity driver	Knowledge and information	essentially driven by the use of knowledge and information for the distribution, exchange, and consumption of goods and services to
	ICT	reflect the latest stage of development in the evolution of modern economies which is characterized by an increased use of ICT, globalization, active networking and
Innovative policy	Innovation	application of innovative solutions that meet emerging markets' requirements, unarticulated and existing market needs, using
	Tools	tools such as technology, education, science, research, conducive framework and stimulating collaboration and demand for continuous innovations through standards, and regulations
	Economic systems	that serve as concepts for understanding the dynamics and collaborative nature of the various economic systems which ensures continuous innovation in markets and economies.

While highlighting the typical different development stages of the economy, the system has also given an understanding of the various roles that economic policies played in each stage. It is an undeniable fact that, different policies are appropriate at different phases in the economic system. The three stages cannot be separated from one another because they overlap and certain features of each can be identified throughout, starting from the 1900s to the current knowledge economy which is characterized by industrialization, globalization, advanced innovation, information and communication technology. The knowledge driven stage of the modern economy has brought about a wider range of globalized economic competition, even in emerging economies. The interconnectivity of the various activity drivers of the modern economy has been presented in the below fig. 1, and it shows how knowledge economy heavily rely on these economic activity drivers.

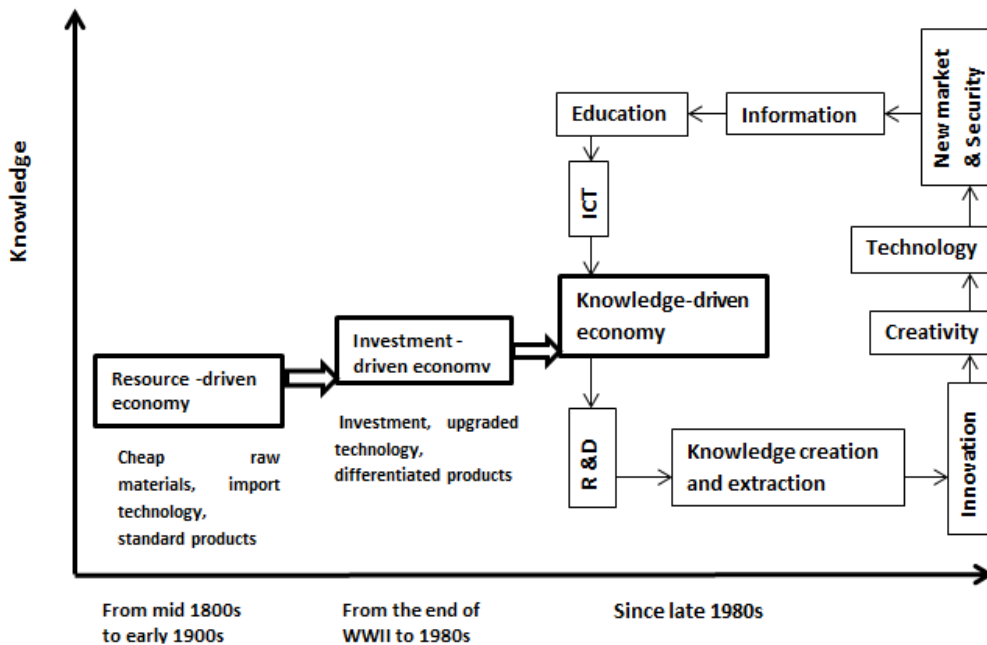


Fig.1 Model of activity drivers in knowledge economy

Knowledge economy activity drivers are interconnected to each other and also drive the economy in a cyclical form, and this makes each activity driver's role in the economic development dependent on one another.

Conclusions: Knowledge has become the fuel for modern economic growth and industry's development in every sector of the world economies. This article through the use of multi-metric table has provided a comprehensive definition of knowledge economy and should be considered as the most reliable definition.

The study has also proved that certain elements drive the modern economy and certain factors of globalization such as international trade, and communications are accelerating the distribution and use of information and communication technology across global borders. Creative ideas and new and improved innovative technology are spreading faster than ever in world's history, this is why a multi metric definition of knowledge economy has been developed to throw more light on it for a clearer understanding of knowledge economy.

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