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A General Theory of Innovation and National Intellectual Capital

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***Abstract* – In this theoretical article, we revisit the notion of the intellectual wealth of nations. A slew of economic measures such as Gross Domestic Product, Per Capita Income, and Purchasing Power Parity exist as indicators of economic wealth. However, these are historical and measure only tangible outcomes, and that too in monetary terms. The intellectual wealth of nations is a notion that is future-oriented and includes intangible assets that may be applied to generate growth and development. The scholarly literature suggests that this is comprised of knowledge as a raw commodity; intellectual capital as its useable form; and innovation as it is applied to products and processes. In this article, we argue that innovation as the application of intellectual capital for the purpose of growth, and ishence the key process dimension in determining the wealth of nations.**

***Keywords* – Information Society, Knowledge Assets, Innovation, Growth and Development.**

I. Introduction

The pursuit of development is a key activity of most nations. Wealth arising from this development is commonly associated in the tangible domain such as cash, clothes and other goods for necessities or luxury based consumption The key aspect of a nation's wealth highlighted by several scholars (Bontis, 2001, 2004; Bradley, 1997; Dutta & Caulkin, 2007; Edvinsson & Stenfelt, 1999; Pirjo & Ahmed, 2008; Stewart, 2001) and institutions such as the World Bank (Hamilton, 2006; World Bank, 2008, 2012; INSEAD, 2009, 2010, 2011, 2012) refers to the intangibles. This is also known as intellectual capital, that also contributes significantly to a nation's competitiveness, productivity and economic development (Bontis, 2001; Bounfour & Edvinsson, 2005; Lin & Edvinsson, 2011). These resources are knowledge assets that form the source of an organisation's or country's competitive advantage (Boisot, 1998; Bontis, 2001). They may even include measures of social or relational capital such as Bhutan's Happiness Index (The Centre for Bhutan Studies, 2013).

Hilbert &López (2011) have attempted to measure information and communication capacities of nations as a proxy for their information processing abilities. They reason that the greater the processing power of a nation, the higher its ability to generate wealth. We believe this is a circuitous approach. In this article, we argue that it is innovation that is the key generator of growth and development, and hence intellectual capital. Wealth is an outcome of a nation's growth efforts and innovation is commonly considered a key process to drive economic growth. Innovation has grown in relative importance in powering a nation's growth, namely in the development of new products and services, which in turn drives economic growth (Bismuth & Tojo, 2008; Pirjo & Ahmed, 2008). Bismuth and Tojo (2008) also suggested that the intangible assets of a nation will typically account for a larger proportion of the valuable outcomes created in its economy. This presents challenges to nations in formulating policies to optimise, diffuse, protect and control these intangible assets.

Effective and efficient diffusion of knowledge is important for the process of innovation. Innovation requires a large and diverse base of knowledge for the creation of new types and levels of knowledge in a firm or economy (O'Sullivan & Dooley, 2009). Innovation will involve the combination of tangible and intangible resources of a nation for economic outcomes. This inter-play of resources and processes sets the research impetus to investigate the role of innovation in the intellectual capital of a nation.

In this article, we shall explore the question of what constitutes the intellectual wealth of nations. The scholarly literature suggests that knowledge assets, innovation management and intellectual property are three stages that lead to the development of intellectual wealth (Al-Ali, 2003). Sharma et al. (2008; 2009; 2010a; 2010b) have presented variations of the World Bank's (2012) framework for identifying and measuring the knowledge economy in terms of the fundamental pillars of knowledge assets. This article reviews the philosophical underpinnings of National Intellectual Capital (NIC) in terms of both assets and innovation and delves deep into the inter-play of the two. The body of the article, over next three sections, reviews the theoretical foundations of NIC and the role of innovation in this. The article concludes with a synthesis of the research and poses three fundamental research postulates in our understanding of NIC.

II. Intellectual Capital and Innovation

Innovation is usually associated with an outcome in economic growth depending on the type and level of innovation found in a nation (World Bank, 2008). Economic growth is an important objective of every country and the growth report by the world bank highlighted that is not the end state in itself but as platform and necessary condition that allows the a nation to achieve other objectives (World Bank, 2008). World Bank (2008) also stressed that in the globalised world that is highly connected and integrated, countries are able to acquire knowledge from anywhere in the world through foreign education, foreign investment and technology transfer in

order to learn faster. Therefore, a nation's intellectual capital is no longer restricted by its geographical boundaries.

The above implies that there is a larger and diverse knowledge stock that a nation can call upon to create new knowledge if the nation has effective means and infrastructure, such as modern information and communications technologies (ICT) to reach out into the world to do so. World Bank (2008) predicted that the future trend of nation's growth will come from innovation that draws from the knowledge found in this rich intellectual capital that includes physical and human resources, of which services will rise in its contribution to overall growth (Bontis, 2001).

What exactly is this intangible intellectual capital of a nation? Intellectual capital can be understood in a simpler form using the micro level lens of a firm, in the form of a commonly used framework of human capital, structural capital and relational capital as consolidated by Delgado-Verde, Castro, and Navas-López (2011), Society for Knowledge Economics (2005) and Dumay (2009). Extrapolating this framework to a nation; human capital would generally refer to the knowledge found in a nation's residents, structural capital would refer to knowledge embedded in a country's infrastructure or institutions while relational capital would refer to knowledge found in its dealings (diplomatic or trade relations) with other countries (Lin & Edvinsson, 2011).

On innovation, the dictionary definition starts from the root word 'innovate', which is to "make changes in something established, especially by introducing new methods, ideas, or products" (Innovate, n.d.). Therefore, the innovation process that occurs in the nation can be described as the making use of tangible and intangible human, structural and relational resources in combination to generate desired outcomes, normally in the forms of products, processes and services that in turn will result in the achievement of national goals such as economic growth. For example, intellectual capital in a firm of a nation produces a physical product that has a global demand (e.g. smart phones) and its ease of export to other countries is aided by Free Trade Agreements (FTAs). These exports contribute to the GDP growth of the nation while the FTAs represent a nation's relational capital. While many in the scholarly research community focus on the economic outcomes of innovation such as gross domestic product (GDP) growth, little is mentioned of the role that innovation plays with respect to its raw material, i.e. the intellectual capital. It is almost taken for granted that something positive should happen to the raw materials should there be a positive outcome from economic growth.

Some intellectual capital literature briefly mentions this such as the CIMC model where it describes that each of the two higher stages will be "feeding back to where it started" (Al-Ali, 2003, p. 65). There is a brief description about the recycling of knowledge that creates new knowledge back to the higher two stages but there is no detailed elaboration on this feedback loop the CIMC model. The main themes of literature researched so far mostly indicates innovation as a key component in "an organization's ability to create value" (Al-Ali, 2003, p. 8) or as an important factor in "business performance and economic growth" (Bismuth & Tojo, 2008, p. 228).

The key motivation of this research is in investigating the specific roles that innovation performs on the intellectual capital of the nation. The approach looks in the opposite direction of the innovation process to gain deeper insights about the intellectual capital of a nation. It is important to understand the specific roles performed by innovation in order to assess the subsequent implications (if any) in terms of managing these raw materials. For example, if innovation added value to its raw material, then how possibility could it had done so and if there were any quantifiable evidence to substantiate the intellectual capital growth of the nation in question? Bismuth and Tojo (2008) and Bontis (2001) raises the general problems encountered in accurately measuring intellectual assets for nations, which results in challenges in presenting an accurate account of a nation's progress at both the macro and micro economic level. Hunter, Webster, and Wyatt (2005) highlight that the effort in measuring the intellectual capital should result in useful management outcomes for control, development and forecasting to external entities. Therefore, insights into the role of innovation in the growth of the intellectual capital of the nation may lead to further initiatives such as useful frameworks, analytical models or policy instruments to better estimate, create value, showcase or protect the intangible raw materials of innovation.

III. Conceptual Foundations of Intellectual Wealth

We categorise the literature on the important concepts relating to the intellectual capital of a nation. There are three themes. The first theme covers literature concerning the knowledge society that establishes the environment of how knowledge is important and prevalently used in this modern age. The next theme will cover literature concerning the intellectual capital of a nation in the various ways of classifying and measuring it. The last theme looks at the various perspectives and concepts concerning the innovation process.

A. Knowledge societies and economic growth

A useful starting point in understanding intellectual capital can be from the concept of knowledge societies. UNESCO (2003) describes this as an evolution from the information society, where knowledge is embedded in humanistic and social constructs such as culture and politics that develops the society for economic growth. Sharma and Chandrasekar (2010) describes it as a society of people where culture influences the individual knowledge and skills that mutually support each other in a network. Knowledge sharing is a key activity that transforms the society into a network structure that supports innovation and research (Sharma et al., 2008). The central idea is that the knowledge society leverages on knowledge as its principle factor of economic

development, other than the usual focus in utilising technology such as ICT (Kahin & Foray, 2006; Mansell & Tremblay, 2013). Knowledge needs to be optimised and diffused efficiently through proper systems, infrastructure and knowledge policy (Kahin & Foray, 2006).

The above is synonymous with the concept of the knowledge economy where knowledge is leveraged for economic development. Romer (2003) describes the knowledge economy where progress in living standards and the economy are principally determined by the creation and diffusion of knowledge. Bounfour and Edvinsson (2005) describes that the knowledge economy can be characterised by these factors: flat organisations, social capital, research, learning, education and growth. Romer (2003) explains that there are two different characteristics from the exploitation of knowledge in the knowledge economy versus the traditional physical economy. The first is that knowledge does not suffer from scarcity and the second is the notion of increasing returns from knowledge outputs, such as software as an outcome from knowledge intensive work by the knowledge worker. The cost of the reproduction of software is minimal and this software can be re-used by an increasing number of people, a point also echoed by Lev (2001). Another important point is that "knowledge builds on itself" (Romer, 2003, p. 74) where society gets better each time in wealth creation when it engages in knowledge activities in the long run.

On the technology aspect of the knowledge economy, Mansell and Wehn de Montalvo (1998) stressed in their report that industrialised countries are fast transforming to become knowledge societies and that ICT plays an important role in developing an innovative knowledge society. ICT manifests itself in both the strategies and polices developed by nations to build the necessary infrastructure to support their economic growth. Arthur (2011) on the other hand, articulates that a second economy operates simultaneously and interacts seamlessly with the physical economy. This second economy operates in the digital realm where the majority of transactions for economic growth are not visible nor take any physical form unlike the transactions in a physical economy (Arthur, 2011; Sharma et al., 2009).Organisations make up economies and societies. Knowledge organisations will form the majority of the modern economy due to the impact of technology (Bennet & Bennet, 2003). Such a knowledge organisation is deemed to be an "intelligent complex adaptive system" (Bennet & Bennet, 2003, p. 16) where the various agents in the system will bring about the diverse knowledge to solve exploit opportunities or solve organisational problems. From the literature described so far, the emphasis revolves around knowledge and how critical and integral it is to the knowledge society or the knowledge economy. But how does one manage this knowledge?

One way to manage knowledge is to develop sub-components or dimensions about the body of knowledge. United Nations Development Program (2003) articulated the following five pillars:

1) Freedom of expression and good governance.
2) High quality education diffusion and life-long learning.
3) Drive towards science and research.
4) Knowledge based production.
5) Establishing a knowledge model.

Nations can use these five pillars for reference to survey internal national parameters on whether if they conform to what is proposed by UNDP. Assaf (2011) performed a study on the UAE and identified the challenges that the UAE needs overcome. Through establishing a framework and deriving these dimensions, Sharma, et al. (2010a) show how knowledge is created and exchanged in a knowledge society. Nations then can develop methods to manage knowledge that has both explicit and tacit forms (Nonaka, 1994).

Managing knowledge, especially tacit knowledge, is challenging because it is difficult to understand, quantify and manipulated by management (Nonaka, 1994). Even the conventional financial accounting tools are not able to reflect quantitatively and accurately its value (Al-Ali, 2003; Bontis, 2001; Dumay, 2009; Lev, 2001; Sharma et al., 2010). One key reason is because knowledge is intangible and creates value as a bundle rather than in an isolated manner (Andriessen, 2001).

B. National Intellectual Capital (NIC)

Research on organisational intellectual capital can also be used to understand the intellectual capital of a nation. Intellectual capital refers to the knowledge that is found in its employees, processes and relationships with external entities (Al-Ali, 2003; Stewart, 2001). This intellectual capital is about the intangible part of an organisation that is also responsible in achieving the organisation's goals. A common taxonomy to divide this intellectual capital into distinct sub-components is as consolidated by Delgado-Verde et al. (2011), Society for Knowledge Economics (2005) and Dumay (2009): human capital, structural capital and relational capital.

Human capital generally refers to the knowledge, skills and thinking capabilities of the employees in the organisation, structural capital refers to the knowledge embedded in processes, routines, and culture while relational capital (sometimes also known as customer capital) refers to the value arising from having positive relationships with external entities such as customers, suppliers and partners (Al-Ali, 2003). The interactions of these intangibles with other tangibles of the organisation are responsible for creating the competitive advantages of the organisation (Al-Ali, 2003).

Extrapolating the above to a nation, the research by Lin and Edvinsson (2011) perceives the NIC as five types: human capital, market capital, process capital, renewal capital and financial capital. For simplicity intellectual capital can be consolidated into the following three key categories: human capital would similarly refer to the knowledge found in the people of a nation, particularly its knowledge workers using their brainpower to achieve a nation's goals. Structural capital would refer to knowledge embedded in a country's organisational systems, technology, infrastructure or institutions that processes the

flow of transactions responsible for economic activity. Inferring from Boisot (1998) who argued that technology is a manifestation of culture (i.e. culture comes first followed by technology), national culture can also be considered as the structural capital of a nation. Lastly, relational capital can be considered to be the knowledge found in its relations (diplomatic or trade relations) with other countries such as the reputation (e.g. rule of law, business friendly) and soft power of a nation.

Nations need to recognise intellectual capital as a key driver of prosperity when combined with physical factors of production (Bismuth & Tojo, 2008; Kahin & Foray, 2006; Lin & Edvinsson, 2011; Sharma & Chandrasekar, 2010). It is necessary to have sufficient amounts of intellectual capital in a nation to drive innovation, learning, productivity and economic growth while also functioning as the bedrock and indicator in claiming its future national wealth (Lev, 2001; Lin & Edvinsson, 2011). Edvinsson (2003) highlighted that nations are focusing on how to visualise and cultivate intellectual capital in order to turn it into wealth for the nation and therefore, only countries who are knowledge intensive will gain this wealth in the long term.

Pirjo and Ahmed (2008) cautioned that the cultivation of the intellectual capital drivers is very dynamic and needs to be properly managed in terms of its context based on the present situation of the nation, simply because no single driver can remain useful forever. The knowledge behind these intangible drivers needs to be continuously refreshed and improved upon while the dynamics and effects of each type of intellectual capital is economically situational (Pirjo & Ahmed, 2008).

Therefore, a nation needs to first know what it knows to get an absolute or a relative sense of the value of its intellectual capital in order to perform any management on intangibles. In the corporate environment the value of intangibles is commonly calculated by the difference of the market capitalisation and its book value (Al-Ali, 2003; Stewart, 2001) but this methodology will be difficult to apply to the context of a nation since there is no stock market of countries.

The World Bank offers a reasonably useful methodology to estimate the intangible wealth of a nation. It states that intangibles of a nation are primarily made up by its human capital followed by its structural capital (Hamilton, 2006). World Bank (2008) argues for the investment in human capital such as knowledge, skills and even the physical well-being of people than invest in the tangible aspects of the country such as infrastructure. Ruiz et al. (2011) however, argues from their research that structural capital is the primary driver in generating wealth for most developed country and that human capital seems only to be a significant driver of wealth in poorer countries. They also argue that the level of management of a developed nation's intangibles is closely correlated to its GDP trend with R&D being one of the primary indicators.

On human capital, the World Bank (2008) considers skills and knowledge embedded in the work force together with the value of its social capital where people trust each other in the society and cooperate for national goals. Structural capital considers elements of good governance such as rule of the law and efficient national institutions that in turn result in efficient economic activities. The value of intangible capital of a nation is estimated from the residue of unaccounted total wealth after subtracting the sub-total of produced capital, natural capital and net foreign assets from the total wealth.

The total wealth of a nation is calculated using a net present value method based on a sustainable consumption stream referenced from a particular year. The produced capital is calculated based on the value of structures, equipment, machinery and urban land. Natural capital looks at the present value of non-renewable resources and non-urban land such as forests and cropland. The net foreign assets look at national debt since any interest payable will result in a decrease in consumption and hence decrease total wealth. Therefore, what remains is assumed to be wealth arising from the intangibles of the nation.

The World Bank had done estimates of the intangibles for nations every five years for 1995, 2000 and 2005, with 2010 figures still work in progress (World Bank, 2010). The figures of the year 2000 generally show high income OECD countries having intangibles at around 80% of total wealth with middle income countries at 60-62% and low income countries at 55% (Hamilton, 2006, p. 26). These figures support the importance of intangibles argued by the various researchers and academics and suggest that a higher intellectual capital will drive higher income streams for a nation.

The research of Bontis (2004) in formulating an intellectual capital index also argues that human capital is the primary factor that accounts for the value of intangibles in a nation. In his model, he states that human capital development is the pre-requisite condition for the development of the overall intangible wealth of a nation. This involves the people of the national embedding their knowledge into the structural capital of the nation through value creating activities such as innovation, and thereby improving this structural capital for future use. Subsequently, a continuous cycle results where the structural capital will further develop human capital in return.

For example, a nation develops ICT capabilities and infrastructure. This is same ICT capabilities that was developed will result in better communications (internal and externally) and hence improve the sharing of knowledge amongst the people in return as well as acquiring external knowledge outside of the nation. This in turn results in better, faster and timely access to important information that further improves the innovation and learning efforts of the people in the nation that developed the same ICT capabilities. In time, these ICT capabilities can also be exported to other countries and thereby outwardly diffusing the knowledge of the nation.

IV. The Role of Innovation

Innovation has traditionally been considered a value creating and exploiting activity (Teece, 1986).

Its processes cover the entire life-cycle of intellectual capital management (Al-Ali, 2003). Innovation can be described to as a process that combines tangible and intangible capabilities of a nation to generate desired outcomes. Therefore, the innovative capability of an organisation will is closely tied with the capabilities of these raw materials (Delgado-Verde et al., 2011). In advancing the knowledge society, this will involve both hard and soft aspects of the society coming together to generate improved outcomes. Innovation occurring in these societies can be deliberate or serendipitously arising from intrinsic genius, of which the latter can never be formally taught (Drucker, 2003).

The dictionary's definition of the word innovation provides a starting point to understand this process in the context of a nation where it is about making changes to any existing thing and getting some new thing out of it. This implies value creation to which Bismuth and Tojo (2008) considers innovation to be the key process that brings out the different importance of each raw material when these raw materials are combined and changed into something new.

O'Sullivan and Dooley (2009) considers more aspects about the process of innovation in terms the scale and type of changes during the process of innovation, the number and level of human resources involved, the beneficiary of the process and the application of this process. From these different facets of innovation, O'Sullivan and Dooley (2009) propose this comprehensive definition:*innovation is the application of practical tools and techniques that make changes, large and small, to products, processes, and services that result in the introduction of something new for the organization that adds value to customers and contributes to the knowledge store of the organization*. (p. 5)

At the national level, innovation is important for benefiting society and economic growth (O'Sullivan & Dooley, 2009). This growth is found not just in the typical tangible outcomes such as profit and quality of products or services, but also in the intangible aspects such as growing the stock of knowledge and experience of the organisation which will in turn drive the character of the innovation found in the organisation. Creativity and learning are considered by O'Sullivan and Dooley (2009) to be the foundation of new knowledge creation.

Drucker (2003) argues for a deliberate, organised and disciplined approach to innovation where innovation needs to be focused on the organisation's opportunities, to be proactive action at the customer level, to be simple, to start from the little things and always aim to lead the market. He articulates three conditions for a successful innovation: innovation is about a lot of effort and knowledge, innovation builds on an organisation's strengths and innovation effects changes to the people in the economy.

Looking into the steps taken during the innovation process allows gaining further insights on the purposes of each of the steps. Al-Ali (2003) describes a generic New Product Development (NDP) model consisting of six stages from idea generation to commercialisation. The Social Learning Cycle (SLC) in the information space proposed by Boisot (1998) can also be considered as another model of the innovation process where it creates and diffuses new knowledge from the scanning stage to the final impacting stage. It is inferred that innovation generally consist of actions that involve surveying the environment, developing new solutions, testing it and if it works, pushing it into the market to reap the returns.

The literature discussed so far showed two main views about innovation as described by Asimakou (2008). The first describes the traditional economic view where innovation is viewed as a key objective of organisations for growth and survival purposes in response to the fast changing environment of the modern knowledge economy. It is about the outputs, the products and services that have to yield returns. The second is about the knowledge and its related resources that contain this knowledge, especially the human resources that are needed for innovation. It is about the inputs and how best to nurture and manage them. In the example of R&D by Asimakou (2008), it is highlighted that there will be other benefits that arise from the R&D process. These are the increased competency of personnel from training, innovative culture, cohesiveness amongst the researchers and other ideas arising from the explorative research process which can be followed up separately as new research. It is inferred from the above example that human capital (increased competency and new ideas), structural capital (new processes and research methods) and relational capital (cohesiveness amongst researchers) can be considered to have benefited from the research process whether there was a successful end product or not.

Innovation is considered by the World Bank (2008) in its growth report as one of the key outcomes promoted by many nations' policies because it enables the economy to learn and develop new capabilities and markets, which in turn sustains the growth of the nation in the long term. When innovation results in a new paradigm to the market, there are several implications highlight by Teece (1986) and Jacobides, Knudsen & Augier (2006). The particular innovation will eventually settle into a dominant design which can come from the first mover or follower. This process is described as the consumers' continuous experience with a new product that will eventually lead to such standardisation of a dominant design, indicated by a downward movement of the "Evolutionary Production Function" (Boisot, 1998, p. 25) that represents an economising on physical resources through the substitution with data.

For example, a car operating on four wheels is the current dominant design. It could have been three wheels or five wheels but issues such as cost, engineering feasibility and performance would come into play in determining the current dominant design. Once the

dominant design is in the market, the attention will shift away from design to other aspects about the product such as price or branding (Teece, 1986). Innovation still continues in the complementary assets (e.g. distribution and marketing capabilities to push the innovation into the market) that support the primary innovation. The availability and control over these assets will determine whether the owner of the innovation can continue to reap the benefits from the initial innovation (Teece, 1986).

Innovation affects society and the research on work by Kinston and Rowbottom (1989) is useful in differentiating the levels of innovation in a nation. Kinston and Rowbottom (1989) proposes a framework of seven levels based on different levels of abstraction, different time duration span and different needs that are fulfilled. The lowest level refer to work that involves a pre-determined output that fulfils short term needs and requires only basic abstraction, such as work done by a factory worker in a production line. The highest level refers to work that requires a high level of brain power needed to solve long term problems and covering a wide area of needs of the nation. For example, work performed by ministries of a nation in creating long term structures such as setting up a research institution that contributes to the nation's long term R&D needs. The other five levels between these two levels represent the spectrum of the different gradients of work. A key purpose of innovation is to enable the a nation to do work and therefore, this framework can be used as a proxy to differentiate the effects of innovation at different levels of needs, time span and level of abstraction.

This implies that governments must comprehensively provide appropriate protection regimes such as intellectual property protection laws as well as developing economic policies and infrastructure. This allows complementary assets to grow and support the primary innovation (Teece, 1986) as well as supports innovation at different levels from the most basic to the most abstract needs. Complementary assets also contribute to the economic growth of the nation as well. Jacobides et al. (2006) also highlights that the industry architecture, such as an operating standard arising from the new innovation is also shaped by government policy other than driven by technical factors. Once an industry architecture is set, it is difficult to change it due to latency to change by new players, existing rules set by the government and customer's expectations (Jacobides et al., 2006). This will affect driving new innovations to further the economy in the long term, especially in area of disruptive innovation that can benefit the nation as a whole in the long term though it may not benefit companies and the economy in the short term.

Disruptive innovation significantly affects industry structures and social behaviour (Christensen, Baumann, Ruggles, &Sadtler, 2006). Christensen et al. (2006) and Drucker (2003) describes this as the opposite to sustaining innovation which is more common in the market and has characteristics of being cheap, simple and convenient to the customer. Boisot (1998) describes this as the S-learning process where paradigms of new knowledge replace each other over time through efforts in the deliberate destruction of the old knowledge base. The effects of these disruptive innovations often result in large swings of market share loss by incumbents and social changes by customers. For example, low cost airlines in recent years have grabbed significant market share from incumbents and customers are able to change their expectations of comfort and amenities after they used these low cost airlines. However, to come up with disruptive innovation is not easy as often, mistakes are not tolerated in organisations or failure is swept under the carpet rather than learning from the failure and seizing the opportunity to develop a new growth market (Christensen, 2007).

In summary, this literature first explored literature on knowledge societies to understand the modus operandi of such societies and its key resource – knowledge. However, knowledge is very fluid concept (Davenport &Pruzak, 2000) and thus literature and frameworks under intellectual capital was explored to classify the knowledge into the simple constructs of human capital, structural capital and relational capital. Methods to measure the intangible nature of a nation's intellectual capital was also researched on to provide a tangible sense of intangibles when compared to the total wealth of a nation. Literature on innovation concerning useful definitions, processes, steps, analysing approaches, after effects was researched on.

V. Synthesis and Concluding Remarks

The scholarly literature on the intellectual wealth of nations has provided useful insights in identifying the key roles of innovation with rest to the intellectual capital of the nation, when juxtaposed with insights learnt from knowledge societies and the intellectual capital of nations. In other words, the various "pillar approaches" of the World Bank, UNESCO or UNDP, where the various components of NIC function as silos in both specification and measurement, is limited by a static purpose. A better way of thinking about the intellectual wealth of nations may be to map the indicators of the life-cycle stages of innovation to the outcomes of growth and development. These concepts may be used to construct a conceptual framework to represent the significant roles of innovation in the intellectual capital of a nation, their impact on the growth of intellectual capital and identifying useful measures.

To recapitulate, the arguments made in this article seek to answer the following important questions in order to clarify the useful outcomes from research on the NIC:

1) If innovation has a positive outcome on the intellectual capital of a nation such as creating more intangible value, then how exactly does this occur? This motivation is similar in questioning how the apple fell from the tree in the common story of Newton's discovery of the laws of gravity. As highlighted by Dumay (2009), investigating the 'how' uncovers more useful insights than focusing on the 'what'. Apples commonly fall from trees

and in this context, that innovation has a positive impact on intellectual capital and economic growth. However, Boisot (1998) explains that the knowledge of concrete outcomes does not necessary always precedes the actual codification and abstraction of that outcome. More often than not, using the example of aerodynamics, the deep and codified knowledge of aerodynamics was a post event undertaken to document the early success aircraft flight by its pioneers. Planes did not start flying only after the discovery and the codification of the laws of aerodynamics. They already started flying before. In this dissertation, the concrete outcome is the economic growth and the first two objectives seek to investigate and codify the roles of innovation in the growth of intellectual capital of a nation, which in turn drives economic growth.

2) If the said role of innovation is established, what then is its usefulness other than for questionable rankings? The third objective of this review seeks to answer this by determining measures that are more closely related to the trend of innovation, thereby establishing a set of useful innovation-based, intellectual capital growth measures. Nations can then better understand, monitor and manage the growth of intellectual capital and their innovation strategy. There are many ways to measure the intellectual capital of a nation such as a human development focus (Bontis, 2004) through educational and hygiene indicators but this research focuses on the innovation aspect.

In closing, economic growth is important but knowing exactly how the process of innovative grows the intellectual capital of a nation is just as important because the underlying theoretical basis may reveal deeper insights and has larger implications than the concrete outcome. The literature review performed in this paper forms the foundation from which key roles of innovation in relation to the intellectual capital of the nation can be identified and further developed onto a useful framework or analytical model. This will better present the intellectual capital of a nation in a more useful form that in turn can be used as a tool for more analysis and subsequently initiatives for better outcomes.

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