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Dinker Raval  
*Morgan State University*

Bala Subramanian  
*Morgan State University*

Bina Raval  
*Towson University*

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# Managers as Champions of National Competitiveness through Strengthening Knowledge Infrastructure

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Dinker Raval, Bala Subramanian, and Bina Raval

The global competitive landscape has dramatically changed in the last two decades. New entrants in global trade such as China and India have emerged as economic powerhouses to whom the United States and the European Union have outsourced parts of their manufacturing and service sectors. Strengthening competitive advantage has become a front burner issue

Dinker Raval, Ph.D., is a professor in the Earl G. Graves School of Business and Management, Morgan State University, Baltimore, MD 21251.

Bala Subramanian, Ph.D., is an associate professor, in Earl G. Graves School of Business and Management, Morgan State University, Baltimore, MD 21251.

Bina Raval, Ph.D., is an assistant professor in the Department of Psychology, Towson University, Towson, MD 21252-0001.

for both developed and developing nations. The Developed nations want to maintain their competitive edge while the developing nations want to enhance their own ability to compete. This has renewed interest in finding new answers to the eternal question: what makes a nation's economy globally competitive? Does enhancing competitiveness require more brawn or brains? If it is accepted that both brawn and brains are equally essential, many poor nations of the world are automatically excluded as having no potential for competing in the global economy, as most of their population is presumed to lack brainpower because of illiteracy and poverty.

The reality is quite the contrary. In all nations, human resources are endowed with brain potential. This is the only resource the nature has endowed evenly. The key to achieving competitiveness is to strategically nurture and develop this brainpower,

contributing to national competitiveness. This, in turn, depends largely on the core knowledge infrastructure (CKI) of a nation and its accessibility to all segments.

The objective of this article is to examine the role of a nation's Core Knowledge Infrastructure as a key driver of national competitiveness. It underscores the importance of managers acting as champions to strengthen the CKI of a nation to maintain and enhance its competitiveness. It examines major knowledge competitiveness models and points out the fuzziness that exists in these models due to the overlap between facilitating variables and knowledge outcomes of the elements of the infrastructure. This article presents a conceptual construct of the CKI as the corner stone of success of knowledge economy, based on the experiences of Japan, India and the United States.

## Review of Literature

A review of literature related to national competitiveness framework reveals that the competitiveness theories have their roots in classical economics. Classical economists have provided varied explanations of what drives a nation's competitiveness. Ricardo attributes the comparative advantage to the differences in a nation's productivity (Ricardo, 2004). Heckscher and Ohlin stress that comparative advantages occur due to differences in nation's factor endowments (Ohlin, 1933). Vernon's product life cycle theory argues that where a new product is invented and produced is critical in determining the competitive advantage because the wealth and size of the economy play a role in enhancing economy's ability to innovate (Vernon, 1966). Lieberman and Montgomery, proponents of the first-mover advantage, suggest competitive advantage is gained by pioneers who gain economic and strategic advantage from being a first entrant in an industry (Lieberman & Montgomery, 1988).

Tom Friedman suggests that it is the convergence of technology and events that makes nations globally competitive by analyzing the case histories of China and India (Friedman, 2005). He concludes that the

convergence of enabling factors like new technologies, liberalization of trade policies and other global developments enabled countries such as India to achieve competitiveness in global markets.

Though these explanations provide useful insights, the essential question that remains unanswered is this: what drivers sustain the long term competitiveness and growth of a nation? The experiences of Japan, India and the United States of America point to a nation's stock of knowledge as this key driver.

These experiences are significant to understand the real forces behind long-term sustainability of a nation's competitiveness. India can be viewed as a rising star, Japan as a stagnant star and the United States as a nation that has continued to maintain its competitiveness, albeit its vicissitudes. The experiences of these global players can be significant in achieving, maintaining and/or losing global competitiveness.

### The Case of India

India's has surprised many observers with its emergence as a global competitor, particularly in information technology, engineering, pharmaceutical and service sectors. Most

analysts look at India's competitive strengths through the lens of successes of these sectors. Others credit India's central planning process as providing a sound framework of planned growth. While these explanations have elements of truth, they serve as no more than facilitators rather than drivers of competitiveness of India.

The watershed event in India's competitive turnaround was the liberalization of economy. This process leveraged the untapped potential of India's human capital within the framework of market economy. This enabled India to maximize utilization of its existing well-educated and skilled human resources. The pool of human capital was created earlier by India's CKI. The role played by this critical driver is often missed by analysts.

### The Japanese Experience

Scholars ranging from Theodore Levitt to Tokeuchi, who studied the case of Japan's entry into global market, rise and stagnation of its economy's global competitiveness provide different explanations that follow. Levitt in his article, *Globalization of Markets*, argued that the combinations of price, quality, and delivery made Japanese firms competitive

with global competitors (Levitt, 1983).

Michael Porter attributed Japan's success to four interconnected influences of right kind of the business environment such as the context for firm strategy, the quality of factor conditions, the quality of locally related and supported industries and the quality of demand conditions (Porter, 1990). He categorized them into basic factors such as natural resources, climate, location and demographics and advanced factors like communication infrastructure, sophisticated and skilled labor, etc. He stressed that advanced factors are more critical for the competitive advantage of a nation.

Other writers have attributed Japan's success to its relentless devotion to quality. When the Japanese economy was practically leveled by World War II, Japan's skilled human resources and its focus on quality and customer satisfaction enabled it to outcompete its global rivals. They captured a significant marketshare by offering the market with the quality strategy and gained major competitive advantage.

Despite this, Japan has encountered a phase of slowdown and stagnation. Takeouchi attributes Japan's slowdown to its inability to participate in the globalization of labor markets, particularly in the

knowledge intensive upscale, high value, white collar market (Takeouchi, 2004). He identified the indicators of the ability to participate in this segment: engineering students' inclination to work for global firms, the number of executives on the board of global firms, the number of senior executives in the global investment banks and consulting firms and the number of tenured faculty in leading international universities. According to Takeouchi, the Japanese presence was not noticeable in the global corporate and academic worlds because Japan's human resource development, particularly its educational system was not in step with the rest of the world.

### **Narrow Prisms**

Both India and Japan achieved global prominence through the growth of specific industries that acted as catalysts that gained acceptance by rest of the world. Japan rose through the growth of auto and electronics manufacturing industries. It focused on quality and consumer satisfaction as their priority and not on innovations. The emphasis was on improving the industry's physical infrastructure and realigning their production facilities.

Similarly, India's competitiveness is achieved through successes in selected industries such as software, pharmaceuticals and services. In contrast to Japan, India has proven its potential and ability to participate in the power blocks identified by Takeouchi. India's success in global, academic, corporate investment and consulting sectors became possible by its human capital created by its network of outstanding technology and management institutes. However, only limited attention has been given to CKI. Because the knowledge infrastructure is controlled and dominated by government, its ability to innovate and enrich CKI has been hampered.

Japan and India have both made strides in global market through successes in selected industries. But they have failed to recognize the critical role that CKI plays in sustaining the long term competitiveness of the economy.

### **Components of CKI**

Core Knowledge Infrastructure consists of institutes, agencies, systems, processes, procedures, directly and indirectly involved in knowledge creation, impartation, diffusion, evaluation and quality assurance. It also includes a

system to ensure global knowledge accessibility and continuous improvement of the quality and size of a nation's stock of intellectual capital.

Innovation is often referred as the key to a nation's development. It should be emphasized that a culture of innovation is nourished by CKI. CKI replenishes a nation's pool of intellectual capital and empowers its human resource development system.

When competitiveness of nations such as India and Japan are viewed exclusively through the narrow prism of successes in selected industries, analysts miss the fundamental driver, which is its CKI. The United States provides an excellent case study of where a robust and vibrant CKI plays a significant and sustaining role in maintaining and enhancing national competitiveness.

## **The American Experience**

Scholars and analysts often attribute the success of the United States to its free enterprise system and its democratic framework. These factors, however, only facilitate its global competitiveness. The root cause of American competitiveness is the exemplary quality and competence of its human resources. This competence,

in turn, has been empowered by its dynamic CKI which has ensured a continuous flow of new knowledge in general as well as in specialized areas. It is well served by businesses, government and third sector networks that are dedicated to keeping the nation's CKI highly competitive. There is recognition of the fact that current knowledge has a rapid rate of obsolescence and there is a need to replenish it in order to maintain currency and competitiveness.

Historically, the United States had the advantage of a robust and aggressive CKI. Before and immediately after World War II, the private sector was engaged in producing goods and services to serve the fundamental needs of the domestic consumers. The U. S. firms were not very much interested in exploring global markets. As the market for basic goods became saturated, focus shifted to meeting peripheral needs instead of fundamentals. Roughly a corresponding shift occurred in the U.S. educational system. Its focus shifted away from core disciplines such as mathematics, science, reading, and writing, which are the very foundation of real knowledge and intellectual capital of the nation to emphasize softer disciplines and skills.

This misplaced focus is currently hobbling American

competitiveness. It is a reason why the United States is experiencing critical human capital shortages in areas like medicine, engineering and the sciences. It has to look abroad for replenishing its CKI by importing skilled human capital from other nations.

The basic CKI of the United States is still in good shape except it is only weakened by a misplaced focus on soft skills in its schools. However, the U. S. system has built-in insurance within its framework that allows for the flow of critically needed knowledge resources from abroad. The immigration policies, though politically controversial, are designed to respond to changing needs of the economy and allow the inflow of brainpower from abroad with incentives.

In contrast, other nations have attempted to pursue short-sighted autarchic policies in the area of knowledge infrastructure. They feared brain drain and restricted the flow of students and other experts to go abroad. Later, they realized the lack of wisdom of these restrictions and relaxed them. They have now benefited a lot from their world-wide diasporas who acquired advanced knowledge and entrepreneurial experiences that they are able to tap now.

This proves contrary to Friedman's proposition that the world is 'flat' and there is a level playing field. The knowledge still flows in a circular fashion, validating Vernon's Product Life Cycle theory (Vernon, 1966). Brain-drained countries have become brain-gained. This is exemplified by the Indian experience that demonstrates the significance of knowledge infrastructure in the development of the nation's competitiveness.

It is critically important to understand how the knowledge infrastructure of any nation is designed and financed and the vital role it plays in the development and maintenance of private to public sectors. There is a symbiotic relationship between the knowledge infrastructure and the development of these multiple sectors. Knowledge is the wellspring of a nation's competitiveness and it nourishes the intellectual capital that is needed to sustain it.

In recent years, experts have viewed national competitiveness from two limited perspectives. First is to view the success from the perspective of selected industries. The other is to perceive it from a global acquisition viewpoint. For example, if the human intellectual capital was not available in one's own country, the strategy was to acquire this capital by

importing from other nations.

Neither approach helps in the expansion of the global pool or even domestic pool of intellectual resources in the end. Many countries now routinely rely on import of intellectual capital from other countries that have a surplus. The United States, The European Union, Canada, Australia and others follow this practice of importing knowledge resources from abroad or to outsource their work abroad. While this approach may solve some issues in the short run, the problem remains unresolved in the long run. The true long term solution requires a shift in strategic focus to strengthen a nation's CKI which in turn, has the potential to expand the pool of a nation's intellectual capital and enhance its global competitiveness.

### **Knowledge Infrastructure Development**

The existing literature on knowledge infrastructure and its various components focus predominantly on firms (Bontis *et al* 1999). The literature dealing with research on development of knowledge infrastructure at the national level is in its infancy (Bontis 2004). However, Chen, & Dahlman (2005) made an attempt on a related concept known as

knowledge economy framework. They view that knowledge framework consists of education and training, innovation and technological adoption, information infrastructure, a conducive economic incentive and institutional regime. Huggins and Izushi (2006) introduced knowledge competitiveness index to benchmark high performing regions of the world. They emphasize investment in research and development, education and training as key ingredients of their findings. These frameworks recognize the role and contribution of knowledge for a nation's economic growth and competitiveness. The frameworks deal mainly with facilitating variables e.g. economic regime, institutional environment such as regulatory quality, and rule of law; and/or the output of knowledge e.g. innovations. While knowledge is the key to economic development and transforms economy into knowledge economy and becomes the engine of economic growth, the fundamental variable of a nation's economic growth and competitiveness lies in the quality and strength of its CKI. We propose a conceptual framework of core knowledge infrastructure that can strengthen a nation's competitive advantage.

## **Distinction Between Knowledge and Information**

Core knowledge Infrastructure has already been defined, but it is valuable to understand what knowledge is. There are literally hundreds of definitions of knowledge and the components that go to form knowledge. We will adopt Peter Drucker's definition for our discussion. Peter Drucker (1991) defines knowledge thus: "Knowledge is information that changes something or somebody, either by becoming grounds for actions or by making an individual (or an institution) capable of different or more effective action." He distinguishes between knowledge and information thus: "Knowledge is not impersonal, like money. Knowledge does not reside in a book, database, or a software program; these contain only information. Knowledge is always embodied in a person; applied by a person; taught and passed on by a person; used or misused by a person" (Drucker, 2003).

Drucker's distinction between knowledge and information underscores the importance of the role of human element in imparting and acquisition of knowledge, while the role of technology and software is mostly limited to management, transfer and processing of knowledge

outcomes. Manyika credits Drucker for identifying knowledge worker as a biggest challenge of the modern era and essential for forthcoming knowledge economy. He suggests that Drucker missed to opportunity to classify different types of knowledge. Such classification could have been the critical source of competitive advantage which managers can use (Manyika, 2006).

Nonaka (1994) distinguished between tacit and explicit knowledge. He refers to tacit knowledge as one that is "subconsciously understood and applied, difficult to articulate, developed from direct experiences and actions and usually shared through highly interactive conversation, story telling and shared experience". Explicit knowledge, on the other hand, is more precise and formally articulated, easily codified, documented, transferred, or shared.

## **Knowledge Taxonomy**

Bloom's taxonomy of knowledge classifies knowledge into cognitive, affective and psychomotor (Bloom, 1984). The cognitive domain refers to knowledge and development of intellectual skills. Affective knowledge implies how one deals with things emotionally such as feelings, values, appreciation, enthusiasm, motivations, and attitudes.

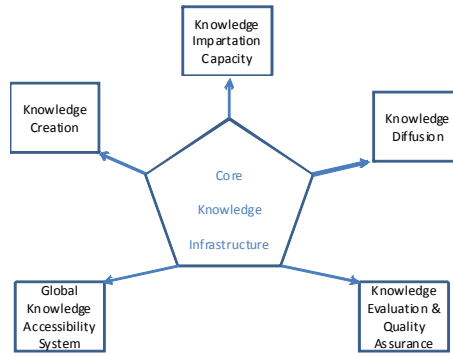
Psychomotor refers to physical movement, coordination, and the use of motor-skill areas. It is practice based and is measured in terms of speed, precision, distance, procedures, or techniques in execution. Cognitive knowledge resembles tacit and affective and psychomotor are closer to explicit knowledge.

This understanding may enable the national and global organizations to design strategies to augment pools of intellectual capital and help create a balance between the knowledge creation and knowledge management. Apparently many private sector organizations are more involved in managing knowledge rather than creating it. They rely on the national environment to provide the intellectual resources. Instead, their strategy should refocus on investing in knowledge infrastructure at the macro level or even global level to enhance knowledge creation processes. It is critical to know the various domains that constitute the CKI. Figure 1 provides graphical representation of CKI domains. Table 1 details the elements of each domain.

## **Domains of Core Knowledge Infrastructure**

Knowledge infrastructure consists of five domains. They are

**Figure 1**  
**Core Knowledge of Infrastructure Domains**



**Table 1**  
**Domains of Core Knowledge Infrastructure**

<b>Explicit Knowledge Creation</b>	<b>Implicit Knowledge Creation</b>	<b>Knowledge Impartation</b>	<b>Knowledge Diffusion</b>	<b>Global Knowledge Accessibility System</b>	<b>Knowledge Evaluation and Quality Assurance</b>
Primary, Secondary, and Higher Institutions of Education	Academic and Research Conferences, Seminars and Workshops	Teaching Faculty Schools of Education	Private, Public, Trade, Technical, and Academic Libraries	Immigration policies Number and Types of Visas	Peer Evaluation of Knowledge Contributions
Academic, Professional, and Research Associations	Collaborative Electronic Networks Blogs	Faculty Development Programs Training and Development Associations Continuing Education Programs	Broadband Connectivity to Rural and Urban Areas Book Clubs, Best Book Competitions	Timeliness of Response to CKI needs Emigration Constraints	Feedback Mechanisms Quality Assessment Systems for Periodicals
Think Tanks	Public, Private, Nonprofit, and Academic Interface Systems	Mentoring Programs Terminal Degree Granting Institutions	Awards and honors for Authors and Writers Book Marketing Networks	Support Systems for Emigrants	Thinktanks Evaluation Processes Nonprofit Agencies that Govern Accreditation
Research Institutes		Research Skills Development Post Doctoral Training Institutions	Reading Habits Promotion Networks		Quality Assurance Programs



creation, impartation, diffusion, evaluation and assurance of quality of knowledge and global knowledge accessibility. Literature until now has focused on knowledge creation for the benefit of organizations as well as on how they can claim proprietary rights by engaging in a differentiation process with the help of technology. It is important to address the process of knowledge creation at a macro level to strengthen competitiveness and the role managers can play in this vital process.

## **Knowledge Creation**

Nonaka explains how implicit knowledge is converted to common external knowledge in a spiral process within the organization (Nonaka & Takeuchi, 1995). This can be extrapolated to the national level, if a nation can be considered an organized system. Tacit and explicit knowledge are assumed to be mutually and freely convertible. This conversion is made possible through four processes that are known as socialization, externalization, combination, and internalization.

Internalization refers to the process of shared formation and communication of tacit knowledge among people. Typical sharing of experiences between people

having a common culture and or who work together effectively may create tacit knowledge. Examples are teams working in the organization on common task and groups working together on national task. The externalization of tacit knowledge into explicit knowledge is quite difficult. But it can be attempted through a process of conceptualization, elicitation, and ultimate articulation. Dialog among team participants, interaction in the form of questions and answers between interviewer and the interviewed, and or eliciting stories are some typical activities for externalization of tacit knowledge.

Transfer of implicit to explicit knowledge can take place through education, training, shared meetings, documents, e-mails and other communication devices. Individuals engage in internalization process to understand information to act on and in the process create their own tacit knowledge. They do this by combining their own tacit knowledge with the knowledge of others. Though the above processes are meant to explain the knowledge creation within the organization, it has the potential for further refinements to be applicable to create a reservoir of knowledge in the economy.

Nonaka and Takeouchi emphasize that 'tacit and explicit knowledge are

mutually complementary entities, which interact with and interchange into each other in the creative activities of human beings. This belief supports our proposition to foster the creation of knowledge infrastructure that will promote exchange of interaction between creative human resources within and between nations.

Another concept articulated by Nonaka to provide context to knowledge creation which he calls Ba. It is a Japanese term implying place, space, or field. He clarifies this further by suggesting that Ba can be seen as shared mental space, and as shared context for budding relationships. He classifies these relationships into physical, virtual, mental and or any mixture of them. Relationships may be virtual through the use of e-mail, mental through the use of shared experiences, or if participants use common goals. Nonaka advocates systematizing Ba for organizational knowledge creation. It can be also applicable to national level if the nation is perceived as a system of organizations.

Understanding the nature of knowledge, how it is created, how technology converts it, how it is imparted, what diffuses it and what agencies are involved in its evaluation and assurance form the very foundation of a nation's knowledge infrastructure.

Mostly private sectors, due to their competitive motivations, are involved in knowledge creation for proprietary gains. This has resulted in knowledge flow and interchange within narrow boundaries and blockages. As the global scenario in national competitiveness is changing, emerging nations from Asia and Africa, with human intellectual potential waiting to be realized are moving to the forefront. It is time to pay attention to developing national knowledge infrastructure with a potential one day to harvest its output for national and global benefit.

### **Knowledge Impartation Capacity**

Another significant component of CKI is the system of assessing and enhancing a nation's knowledge impartation capacity. This capacity can be defined as the strength of a nation's teaching faculty ranging from grades K to higher education. The nature, quality and number of institutions that offer terminal degree education and their ability to impart knowledge and build strong knowledge foundation forms the knowledge impartation capacity. This strength is enriched by what is known as teaching power in countries like India. The availability of supportive technology and resources

has made them accessible for global use.

This is not just valid in higher education but also at school levels. The United States, United Kingdom and Australia are now vying for these resources for their educational systems. Some private tutoring schools are hiring teachers from Bangalore and Bombay to tutor students in mathematics and science through distance learning technology. This is not to imply other countries do not have some indigenous version of this ability. Takeuchi has pointed out that one of the competitive strengths of the nations' human resources is their ability to participate in the global academic market and the tenured faculty in the top global universities. As a part of assessment and continuous improvement of this unique capacity, it is critical to obtain the support and stamp of approval through advanced countries accreditation agencies in all fields such as business, science and engineering, and bring them in to the fold of global knowledge infrastructure.

### **Knowledge Diffusion**

Knowledge diffusion is the process of dissemination of knowledge to individuals and institutions that are willing to learn contribute and enhance the knowledge. Critical to this process are

incentives, accessibility, and varieties of channels used in dissemination of knowledge. Private, trade, professional, public and technical libraries also form the foundation of the diffusion network. Widespread broadband connectivity across the nation is needed to strengthen the network access. Book clubs, best books competition, awards and honors for authors, writers, and competition for young people to read books and cultivate reading habits from the early years in life are other critical factors for diffusion of knowledge. Book exhibitions, book stores, internet cafes, focus on research in the schools to higher education levels also contribute to the dissemination process of the knowledge.

No country other than the United States has such an exemplary, efficient and well-structured network of knowledge diffusion. This is a unique strength of the American system rarely recognized around the world.

### **Knowledge Validation and Quality Assurance**

Another element of the knowledge infrastructure is the mechanism for evaluation, validation and quality assurance. The success of nations to be globally competitive and

remain so for a long time is dependent on not only how the knowledge is created but also how knowledge is validated, evaluated and its quality is assured. This system consists of peer evaluation of knowledge, wide publicity and circulation of knowledge among experts and a free and open exchange of feedback. Availability of professional journals, conferences, and discussion boards are a part of this network. How universities, colleges, research institutes, and think tanks are structured, accredited, and evaluated determines the quality of knowledge and assures the output to remain highly competitive. In some nations this process is non-existent. In others, this process may be poorly designed or dominated by government agencies which are not known for their creativity or objectivity. This precludes a comprehensive multi-disciplinary and multi-dimensional knowledge growth. Occasionally, these nations do succeed in a particular industry or a group of few industries because of targeted government support and or entrepreneurial efforts by individual groups. Japan and India provide these examples of industry focus success rather than multifaceted knowledge growth. The American system again exemplifies the excellence of this process. Universities and

colleges are accredited by nonprofit organizations and peer institutions play a dominant role in its accreditation process that validates the quality and assures continuous improvement in it.

### **Global Knowledge Accessibility System**

Knowledge creation process requires that a nation's knowledge infrastructure should be able to access global knowledge resources and intellectual capital. The ability to tap global resources depends on how well this system is designed, improved and is able to be responsive to changing dynamics of global political, economic, demographic, socio-cultural and technological trends and how this component fits into a nation's core knowledge infrastructure. Two elements critical to this system are a nation's immigration and emigration system and knowledge accessibility diffusion system.

The CKI of the United States exemplifies the best provision. The U. S. immigration system enables its knowledge infrastructure to access global intellectual capital by offering various types of visas to import foreign students, scholars, experts, researchers for short term, long term, and/or on permanent residency. Its emigration

policy is largely nonrestrictive unlike many other countries. American students, researchers, and scholars go abroad to study freely, do research and gain experience all over the world. Students and academicians are able to study and teach in world class universities abroad. Support from programs such as Fulbright and Ford Foundation often provide the underpinning of such outreach.

In stark contrast to the openness of the United States system, many developing countries follow restrictive emigration policies to limit the outflow of talent fearing a brain drain. Such an isolationist approach impedes the free flow of knowledge acquisition and tends to diminish national competitiveness. Another significant element is the accessibility and diffusion of global knowledge. The United States has in place well established institutional and technological networks to facilitate access and diffusion. In addition to commercial networks that offer access and dissemination, there are numerous not-for-profit networks run by major universities. The Library of Congress which acquires a wide spectrum of knowledge and information resources from all over the world and makes them available to researchers is a stellar example.

## Managerial Implications

The globalization of markets and their inter-connectivity has increased the uncertainties and risks of global economic climate and has promoted intense competition between emerging and advanced nations. This requires a reexamination of the role organizational leaders and managers can play in enhancing national competitiveness in the 21<sup>st</sup> century.

Since a nation's knowledge infrastructure is the key driver of competitiveness, then the role managers of the nations' private, public, and non-profit organizations play in innovating, maintaining, managing, and strengthening nation's knowledge infrastructure becomes tremendously critical. The success of individual organizations depends greatly on the quality and the strength of CKI. Organizations draw their intellectual capital from the total knowledge pool of human resources generated by the quality and strength of a nation's CKI and in turn needs to contribute to it. There is a symbiotic relationship between the firm and the nation.

Historically, investment in physical infrastructure and its management has been the preoccupation of

managers, but this is not sufficient (O'Dubhchair at el 2001). Managers need to act as champions of national competitiveness and expand their role to contribute to the national CKI. There are two ways in which they can play an effective role. First, they can extend their managerial perspective from micro to macro level. Secondly, they need to develop strategic horizontal, vertical and cross-sectoral network relationships. They can interface with the leaders of institutions involved in the creation, diffusion, validation, impartation, and global knowledge accessibility system and provide their inputs.

## Micro and Macro Perspectives

Recent management theories assert that a firm can be viewed as knowledge-creating entity. (Augier, et al., 2001). Historically, managers perceive their role as facilitators and protectors of proprietary organizational knowledge. Their inclination is to regard any special knowledge as proprietary and actively refrain from making it public or to disseminate it. The managers tend to invoke the intellectual property laws and litigation as tools. While this is understandable from the individual firm's viewpoint, this retards the

dissemination process and the growth of CKI. Mechanisms must be developed to actively make such insights available after the expiry of patents and copyrights.

Firms may, in some cases, be knowledge-diffusing entities that share knowledge with constituents. This environment of allowing learning and creating knowledge by sharing is known as shared organizational context. The value created by this collaborative process is termed intellectual capital (Cegarra-Navarro and Dewhurst 2006). This tacit knowledge sharing is prevalent in knowledge driven high- tech industries known for rapid obsolescence due to changes in technologies, markets and competition (Augier, et al., 2001).

It has been demonstrated in industries such as information technology and health care, that when managers adopt knowledge-sharing strategies with "innovating firms," their performance and output increase. Managers have to recognize that the nature of knowledge creation is highly interdependent and they need to extend their perspective beyond micro level of the firm. They need to champion sharing knowledge at macro level and create alliances and

partnerships with institutions and entities involved in a nation's CKI. This strengthening the core knowledge infrastructure is likely to enhance competitiveness both at national and firm levels.

### **Networking Across Sectors**

Another important role managers of the organizations can play is to strengthen a nation's CKI is to build and promote network relationships between private, public, academic, and nonprofit organizations to share and exchange knowledge. Nonaka (1994) advocates knowledge is created through conversion and interactions. (Davenport, et al., 1998) stresses the value of supportive culture and incentives for sharing knowledge. (Marcus, et al., 2000) point out how collaborating collectively can make possible the development of artifacts such as software.

Cross-sectoral network relationship for sharing knowledge as a part of management strategy is evident in collaborative efforts of across the board organizations in producing innovation and commercializing them. This is done through national innovation system (NIS) that includes resources and institutions of a country. This system facilitates interactions between universities,

research institutes, and innovating firms that can leverage to commercialize innovations (Spencer 2003).

Since 1990's organizations have built various kinds of inter-firm collaborative network relationships ranging from licensing arrangements and research contracts to joint development agreements, joint ventures, collaborative manufacturing, and complex co-marketing arrangements (Lang, Josephine, 2004). Additional efforts also have been made by private firms to share and integrate knowledge and resources such as supply chain network, business network, and research network (Magnusson, Nilsson, 2003 check). Most managerial efforts so far have been limited to enhance benefits to their individual organizations. They need to involve in activities that create and enlarge the nation's stock of knowledge and the pool of intellectual capital from which all organization regardless of size, purpose, and or nature draw their intellectual resources.

### **Conclusion**

The competitiveness of nations is dependent on structure and quality of its core knowledge infrastructure. The CKI, in turn, needs to be strategically maintained and enhanced both at macro and micro

levels. Managers need to take an active role as champions of this process because the long-term competitiveness of their individual firms will depend on it.

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