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**Increasing Knowledge Flows Through
Global Research Networks**

Anthos Yannakou and Nicolas Gorjestani

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ABSTRACT

This paper explores the evolution of organizational structures from the hierarchical to self-governing network enterprise model that is likely to characterize the knowledge-based organizations of the 21st century. The experience of the recently-established Global Research Alliance (GRA) will be used to explore the challenges facing such organizational forms of the future. The GRA is a network of some of the world's leading knowledge-intensive technology organizations. Each of the nine members of the GRA resembles a network of knowledge workers in its own right. By forming an alliance, a higher level, global knowledge network has been created, linking scientists and engineers from different continents, and from developed and developing countries. The GRA is based on the following principles: natural leadership by emergence; dependence on self-governance and self-correction; and new ways of motivating global network of knowledge workers. In determining an appropriate leadership and organization construct, the GRA members adopted a network model, with principals from each member institution serving on a Board of Directors. The coordinating function has been assigned to a "Nerve Center" -- compared to "Secretariat" in the earlier bureaucratic models. And finally, technical specialists in the focus areas of the GRA (i.e., water, energy, transportation, the digital divide and health) come together in "technology fusion workshops" to formulate common approaches in dealing with some of the world's most intractable problems. Scientists from different parts of the world now converse with their counterparts in other countries on the basis of trust, a shared vision of the future and with a common goal to rise above the hitherto largely national-oriented outlook.

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BACKGROUND

Three distinct periods in modern times, as described by Geuss (1997), are the feudal society, capitalist society and knowledge society. The feudal society valued access to land, with its associated exploitation of natural fertility (Figure 1). This period reached a climax during the colonial times of early twentieth century, although the values of this society are still strong in rural areas and most developing countries.

The capitalist society was sparked by the development of technologies that could harness human labor together with other assets to extract surplus value (Figure 2). This period saw access to capital as being the enabling factor. While much of this doctrine still dictates modern day business, the knowledge society (Figure 3) has made steady progress as an emerging philosophy in the 21st Century.

The value associated with knowledge as an asset is demonstrated in Figure 4, with a comparison of South Korea's and Ghana's GDP. The premium paid for stock market shares of knowledge-based companies over and above the value of their associated tangible assets also demonstrates this phenomena (Gates, 1999).

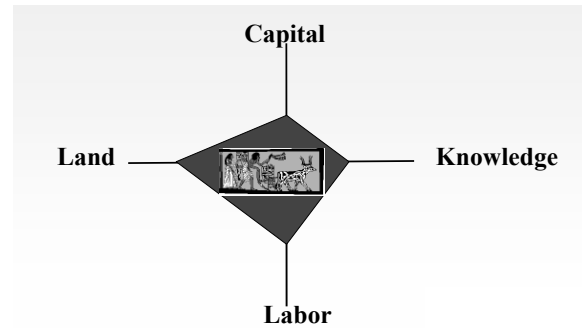


Figure 1: Value in the feudal society.

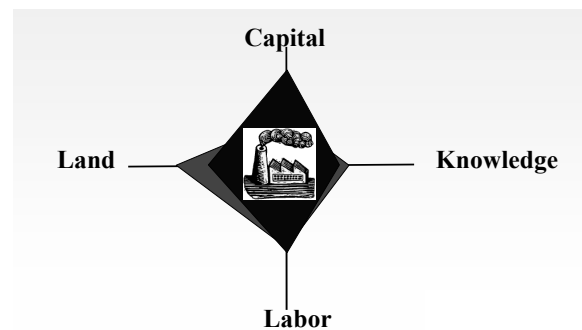


Figure 2: Value in the capitalist society.

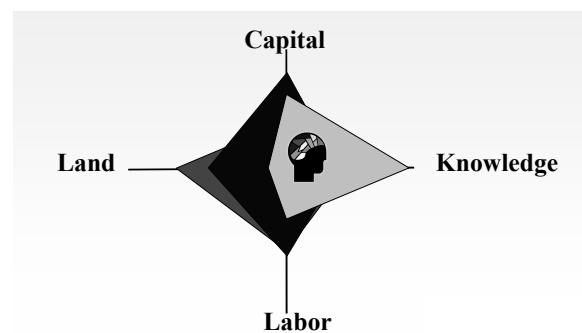


Figure 3: Value in the knowledge society.

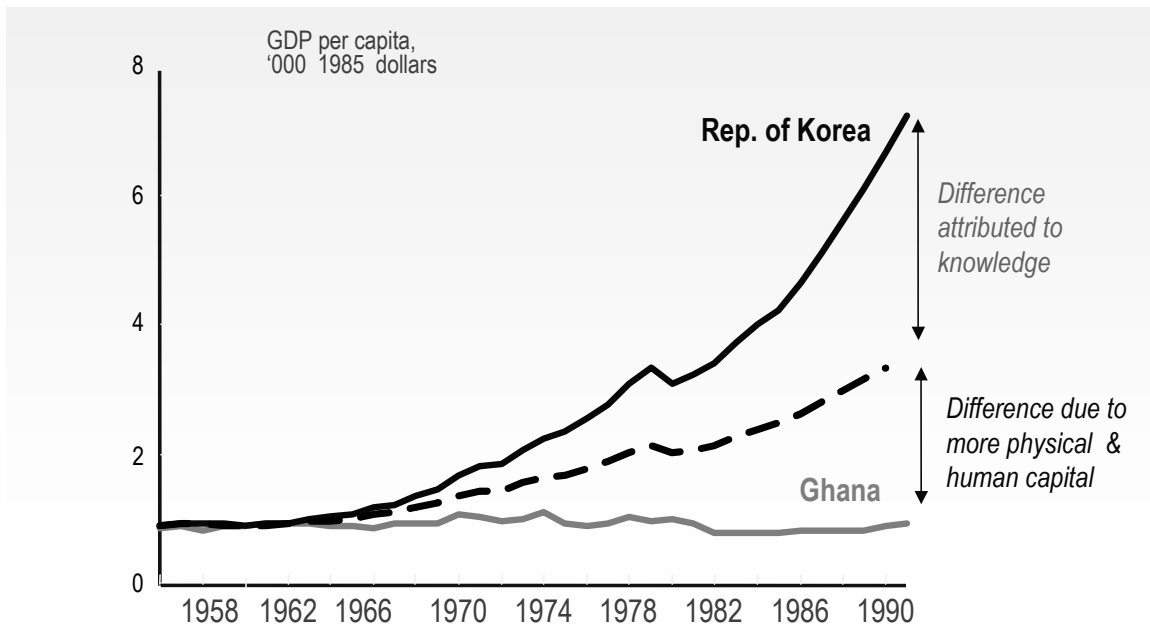


Figure 4: Difference in GDP of the Republic of Korea and Ghana attributable to knowledge².

PARADIGM SHIFT

The industrial era was characterized by generally inflexible processes and structures and a search for the shortest distance between two points. The industrial era scarcity paradigm put a premium on efficient use of scarce factors of production (e.g., land, labor, capital). In fact, the whole concept of management as we know it originates from this mind set. In the knowledge era, however, the notion of scarcity is increasingly replaced with one of abundance, since knowledge is the only factor of production that actually multiplies when it is shared.

In the knowledge era the emphasis will increasingly be on finding the smartest path between two points. Shared learning and collaboration in dynamic networks is one of the principal characteristics of knowledge-based learning organizations. Such a responsive model also affords the opportunity to adapt to the ever-changing environment. Finally, operating in a knowledge economy requires a specific set of competencies and approaches. A comparison of the principles underpinning organizational values and processes in industrial and knowledge paradigms (adapted from Sveiby, 1997) is provided in Table 1.

² Source: "Knowledge for Development", World Development Report 1998/99, the World Bank, p 22.

Table 1: The principles of a knowledge organization (Sveiby, 1997).

	Industrial paradigm	Knowledge paradigm
People	Cost generators	Revenue generators
Manager's power base	Level in hierarchy	Level of knowledge
Main task of management	Supervise subordinates	Support colleagues
Information	Control instrument	Tool for communication
Production	Physical resource to tangible assets	Knowledge to intangible assets
Information flow	Via organizational hierarchy	Via collegial networks
Primary form of revenues	Tangible (financial)	Intangible (ideas, customers)
Production bottlenecks	Capital and skills	Time and knowledge
Manifestation of production	Hardware (tangible)	Concepts (intangible)
Production flow	Machine driven	Idea driven
Effect of size	Economies of scale (production)	Economies of scope (networks)
Customer relations	One way (via markets)	Interactive (via networks)
Knowledge	A tool	The focus of business
Purpose of learning	Application of tools	Creation of assets

The paradigm shifts described above are manifested in organizational structures. The conventional hierarchical structure was the dominant model in the industrial era. This model is evolving with several knowledge-based organizations moving to more flexible and less hierarchical arrangements. For example, since 1996, the World Bank has progressively shifted away from the hierarchical structure by organizing itself around a matrix structure. The matrix has tried to formalize the hitherto informal communities of practice into “networks” to facilitate the creation, sharing and application of knowledge across communities of practice and to promote more effective learning from operational experiences. This shift is depicted in Figure 5.

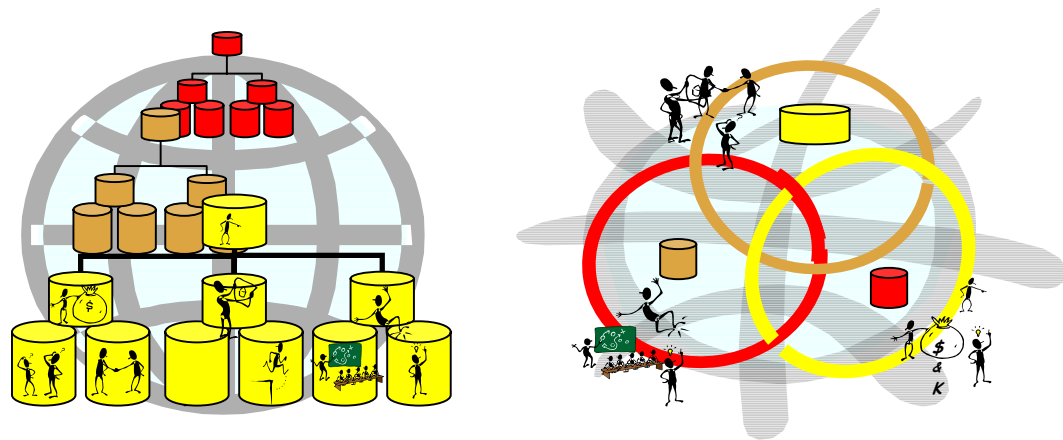


Figure 5: The World Bank's former hierarchical structure vs. the current matrix structure

In the knowledge age, the organizational model of the future is likely to be network based, with the knowledge workers having links to several communities that transcend conventional organizational boundaries. This evolving model is depicted in Figure 6. The main challenges for organizations will be in finding new ways of doing business that are more collaborative and that draw on knowledge workers from several enterprises. How to motivate and reward the knowledge worker in such circumstances? How will these new forms of organizational behavior impact on concepts such as organizational loyalty? What will be the role of the “manager” or the “CEO” in such an organizational set up? Will the CEO be at the top of the hierarchy, or at the nerve center? Will he/she use bureaucratic power to impose authority or apply intellectual leadership to hold the various parts of the networks aligned on the strategic vision? These are some of the questions that enterprise leaders of the 21st Century will have to deal with as they adapt their organizations to the imperatives of the knowledge era.

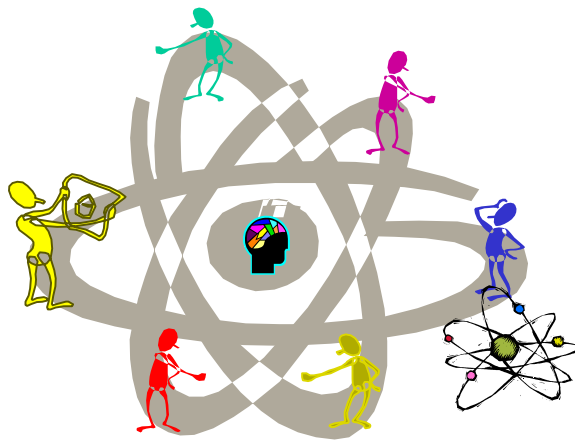


Figure 6: The evolving organizational model of the future knowledge-based enterprise

In addressing some of the fundamental questions of organizational behavior in a knowledge-based enterprise, leaders will have to also come to terms with the nature of knowledge and how people share and learn. For example, what is the distinction between knowledge and information? Albert Einstein once said, “knowledge is experience, everything else is information”. Considering knowledge as “experience” and not a matter of “differential geometry” may have profound implications for the way an organization promotes its sharing. Another fundamental question is related to whether organizational knowledge sharing and learning is a technology issue or an issue of organizational culture and of people?

There are different types of knowledge in an organizational stock and flow sense. The premise of most analyses of knowledge is that it can exist either “within and between minds” (tacit) or be codified in some form or another (explicit). Nonaka (1994) proposed that new organizational knowledge is created by a dialectical relationship between tacit and explicit knowledge as presented in Figure 7 (quoted in Bolloju *et al.*, 2002). Nonaka and Takauchi (1995) popularized four main knowledge transactions based on this distinction.

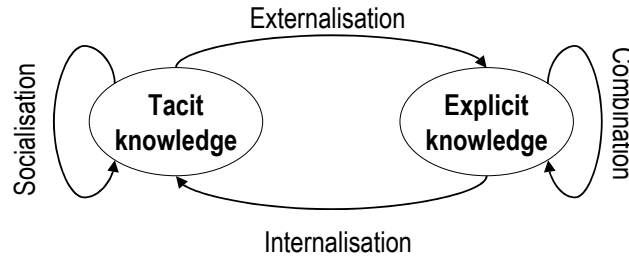


Figure 7: Model for knowledge creation (Nonaka, 1994)

Gorjestani (2002) suggested that it is not only important to understand the types of knowledge and associated transactions, but also to understand what is known and what is not known. Four scenarios are presented in Figure 8.

don't know	<i>what we know we don't know</i>	<i>what we don't know we don't know</i>
	<i>what we know we know</i>	<i>what we don't know we know</i>
know	know	don't know

Figure 8: Scenarios for knowing what we know and don't know (Gorjestani, 2002)

Some of the mechanisms for responding to these scenarios are listed in Table 2 below. Other dimensions of knowledge include types of knowledge (factual knowledge, process knowledge and system knowledge) as well as levels of complexity (data, information, knowledge, meaning, philosophy, wisdom and union) as described by Allee (1997).

Table 2: Responses to knowing what we know and don't know (Gorjestani, 2002)

Scenario	To find knowledge	To learn to learn	To learn to share
What we know we know	Knowledge-bases and informal networks	Use institutional knowledge effectively	Learn from each other by sharing
What we don't know we don't know	Global and regional networks	Learn to learn what you don't know	Build global and regional networks
What we know we don't know	Acquire knowledge through R&D	Find best institutional knowledge	Share with clients and partners
What we don't know we know	Communities of practice	Learn to fill knowledge gaps	Learn from peers & clients

How will network-based, alliance-dependent organizations of the future handle the issues raised above? We are beginning to see some examples emerging, which suggest that the

nature of the challenge will impact the shape and form of enterprises and their alliances. One emerging alliance of knowledge-based organizations which is moving in the direction of network of networks is the Global Research Alliance as described below.

THE GLOBAL RESEARCH ALLIANCE

In April 2002, on the initiative of the CSIR South Africa, leaders of nine knowledge-intensive technology organizations from around the world, met in South Africa for a two-day workshop. This workshop culminated in the signing of the Pretoria Declaration which outlined the following guiding principles of the Global Research Alliance (GRA):

- Undertaking large-impact projects for the benefit of society
- Creating synergy by pooling the energies, skills and facilities of participants
- Promoting projects with high innovation content
- Developing global knowledge networks for industry and industrial sectors to enhance their competitiveness

The participants' commitment to the initiative was carried forward in New Delhi, India in January 2003, when senior executives from the nine organizations signed the Delhi Agreement. The agreement specified the intent, purpose and *modus operandi* of the GRA. The focus of the GRA is reflected in the five thematic areas of water, energy, health, transportation and digital futures, within which thought leaders of the alliance seeks to develop science and technology solutions through technology fusion to address global challenges.

In determining an appropriate leadership and organizational construct, the GRA members considered such issues as the need to rationalize and coordinate slightly different strategic goals, vastly different organizational cultures among its members, and a desire that members participate equally in decision-making while not compromising the ability to make decisions quickly. To this end, a nerve centre was established to facilitate communication among its members and maintain the momentum of the enterprise. The GRA further adopted a three-tiered model aimed at accomplishing parity amongst its members. The principals from each organization serve as a board of directors, with a champion from each organization acting as the primary point of contact. The third level comprise technical specialists working in dynamic teams to identify, develop and implement specific projects.

The GRA can be characterized as follows:

- A self-governing, unincorporated network of networks
- Strong emphasis on new science, namely research focused on links between parts of a system
- Keen on creating and renewing itself through continuous self-regulation and self-correction
- Deep realization that effective alliance leadership requires mutual trust between and among alliance member organizations, and within individual project teams

A Gates Foundation study of alliances in the health sector defined five reasons for forming alliances: (1) Avoiding duplication or redundant effort; (2) taking advantage of economies of scale; (3) sharing risks inherent in breakthrough research that individual firms may be reluctant to assume alone; (4) sharing know-how; and (5) attracting funding through forging a credible and trusted brand identity (Bill & Belinda Gates Foundation, 2002). These motivations are also relevant to the GRA, with advances in several thematic areas having been reported (CSIR, 2004).

CONCLUDING THOUGHTS

Organizations of the future will have to find new ways of leveraging knowledge across enterprises. A different mind set will be needed to “manage” the process in recognition of the following:

- Knowledge resides in people’s minds, not in databases
- I don’t know what I know until I need to know it
- I will always know more than I can say, which is more than I can put on paper
- I don’t know what I need until I need to solve a problem
- It’s not about what we know, it’s more about how we can help our clients solve their problems
- Knowledge is not the exclusive domain of rich countries, nor of the rich in poor countries

The GRA is beginning to find adapted solutions to solving problems based on some of the principles outlined in this paper. For example, the GRA is reaching out beyond organizational boundaries to maximize opportunities for technology fusion and innovation. Similarly, the World Bank is increasingly playing the role of a knowledge broker in helping its clients access relevant knowledge from all sources and to adapt it to the local context to address development issues.

Knowledge partnerships of the future will have to leverage the comparative advantages of organizations using flexible network-based sharing and learning processes. For example, the CSIR, South Africa and the Africa Region of the World Bank have established a knowledge partnership with the objective of sharing experiences and ideas on how the two organizations address the challenges posed by the knowledge era. One of the areas of collaboration involves approaches to capturing and disseminating tacit knowledge of operational experiences embedded in the brains of its respective staffs. The two organizations are addressing this challenge through a debriefing program that helps to create space for reflection and learning. The focus is not on “what was done”, but on “how it was done”. These lessons of experience are captured in multimedia and synthesized into short video clips for “just-in-time, just-enough” dissemination across the communities of practice. The two organizations are also partnering to leverage the debriefing methodology in the context of the GRA. Finally, to share and learn from each other’s experiences in this area and others (e.g., application of indigenous knowledge in the development process, etc.), the CSIR and the World Bank’s Africa Region have established a staff exchange program for selected knowledge workers.

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