

Building Knowledge-Based Economies: Research Projects in Knowledge Management and Knowledge Transfer

Virginia R. Gibson
Associate Professor of MIS, University of Maine, Orono, Maine USA
Gibson@maine.edu.

Small and medium-sized enterprises (SMEs) are viewed as the growth engines of the new knowledge-based economy. This new economic growth model differs from the old in significant ways, many of which are related to the knowledge base that will be required by the SMEs. Based upon prior research a set of factors important to the success of SMEs in a knowledge-based economy is described. Focusing on those factors related to the knowledge base, the paper concludes with a set of research questions and brief descriptions of three research projects on knowledge management and knowledge transfer.

Prior to the 1997 financial crisis the economic growth model in Asia relied primarily on export manufacturing, property development and the banking sector. That model is no longer valid. Increased competition from Latin America and Eastern Europe, coupled with other global changes, have caused governments to search for new growth engines for economic development. Throughout the world national, regional and local governments are expecting small, high-tech businesses to fuel economic growth [8].

There are significant differences between the new and traditional models [see Table 1].

TABLE 1
Characteristics of Models for Economic Growth

| Traditional Model | | New Model |
|--------------------------|---------------------------------|---------------------|
| Non-local | <i>Ownership</i> | Local |
| Formal | <i>Networks</i> | Informal |
| Unequal | <i>Relationships</i> | Equal |
| Parent | <i>R&D</i> | Local |
| Slow | <i>Change</i> | Potentially Faster |
| Potentially Limited | <i>Local Expertise Required</i> | Potentially Higher |
| MNC | <i>Tech Transfer</i> | Internet/Indigenous |
| Complex | <i>Info and Communications</i> | Simpler |
| Large organizations | <i>Information Access</i> | Everyone |

Under the traditional model, high-tech organizations tend to be large, foreign-owned corporations. Economies dependent on multinational corporations are characterized by formal network relationships and inequalities of power [13]. In a study of multinational corporations (MNCs) in Malaysia, Jegathesan [14] found that foreign-owned organizations use their overseas locations for production, while leaving the R&D components with the parent company at home. Technology transfer takes place through the parent corporation. Small businesses, in contrast, are more likely to be locally owned and to have less formal horizontal network structures. An informal horizontal structure may enable SMEs to react quickly to new opportunities.

In a model based on locally owned SMEs, any R&D that occurs is likely to be done in-house and in country. It is unclear how technology transfer will take place under this model, although it is likely that the Internet will play a significant role in the process. SMEs need employees with the ability to access

and validate information, track changes and spot new opportunities for growth. This suggests that the knowledge base needed by SMEs is different from that needed under the traditional model.

Small organizations have simpler communication and information requirements than large organizations [1]. Despite their simpler needs, in the past it was difficult for small business to acquire information and this prevented them from competing effectively. Information access is no longer a barrier. Today basic telecommunications facilities enable small businesses to communicate, access information and participate in markets in ways that were not possible in the past. A reliable, affordable telecommunications infrastructure enables businesses to access e-mail, voice, fax, message services, databases, information, training and e-commerce services. This infrastructure is only part of the foundation needed to succeed in a knowledge-based economy. Other factors contributing to success can be gleaned from prior research on best practices and obstacles to progress.

Knowledge-based Economies: Best Practices and Perceived Obstacles

Research on best practices tends to focus on countries such as Israel, Silicon Valley, Finland, Ireland, or Singapore to determine economic/structural circumstances contributing to success [5,7]

Vinig et al. [18] studied recent developments in Israel and proposed that coordination in three broad areas contributed to the economic success: venture capital, a strong knowledge base, and government policies. In Silicon Valley, the IT-based economy grew as a direct result of active government support, including significant federal funds pumped into R&D projects [12]. The Finnish model [15,19] is based on a strong national strategy that promotes IT and provides significant tangible support for the knowledge base through investments in R&D and education.

Ireland is also an interesting case. According to *Fortune* Magazine Ireland's booming economy moved directly from the agricultural age to the information age, without building an industrial-age physical plant and infrastructure [16]. Ireland's success is attributed to financial resources (foreign investment attracted by favorable tax policies), minimal regulation, and a positive business climate specifically designed to attract investments in technology and pharmaceuticals. The Irish experience may be of particular interest to other countries that do not have a large industrial complex, but want to build a knowledge-based economy.

Hudson [13] examined Eastern and Western Europe to identify common characteristics of successful economies. He concludes that successful economies are characterized by: (1) horizontal networks of SMEs; (2) sound infrastructure including an educated labor force, transportation and communications networks; (3) a governmental mindset that enables and facilitates business; and (4) decentralized regional governance within federal state systems. Although he is cautious about assuming that these characteristics can be transferred directly from west to east, Hudson draws two important conclusions: (1) success is characterized by ongoing efforts to anticipate and adjust to change and (2) the most significant influence is the national mode of regulation [13].

These studies and others yield a set of factors consistently found to be important to economic success. These factors are summarized in Table 2.

Table 2
Factors Contributing to Economic Success
Derived from "Best Practices" Studies

- Financial Resources
 - Venture Capital
 - Local and Foreign Investments
- Government Policies
 - Supportive Business Climate
 - Favorable Tax and Regulatory Policies

- Infrastructure
 - Telecommunications
 - Transportation
 - Power
- Knowledge Base
 - Investments in Education
 - Investments in R&D

Another way to determine factors important to economic growth is to focus on perceived obstacles. Typically, studies of obstacles use surveys designed to capture perceptions of those doing business in a region. Such surveys can be useful both in identifying problems and setting priorities [10, 22].

A large-scale survey sponsored by the World Bank as part of the 1997 *World Development Report* collected responses from 3,951 firms in 74 countries to identify perceived obstacles to business success. Taxes and tax regulations are the most significant obstacle in all countries. Interestingly, this study reveals evolution in obstacles as countries develop. In developed countries labor regulations and safety/environmental regulations are viewed as serious obstacles to progress, yet those are not viewed as important obstacles in developing countries. In developing countries the most serious obstacles (in order) are: tax regulations, corruption, unpredictable judiciary, crime and theft, financing, inflation and infrastructure. In transition economies the order is slightly different: tax regulations, corruption, unpredictable judiciary, unstable policies, crime and theft, financing, uncertain costs of regulations [17].

A similar study by the United Nations [21] focused specifically on obstacles to the use of IT in developing nations. Among the specific factors cited, as hindering IT use are inadequate telecommunications facilities, high tariffs and proliferation of standards. High energy costs and poor power supplies are also serious problems. The study concludes that all countries must invest more in education and upgrading worker and management skills in order to participate effectively in the expanding global information network.

Surveys of perceived obstacles yield a set of factors inhibiting economic development. Those factors are summarized in Table 3.

Table 3
Factors Inhibiting Economic Success
Derived from Studies of Perceived Obstacles

- Government Policies
 - Taxes and tax regulations
 - Legal System
- Infrastructure
 - Telecommunications
 - Proliferation of standards
 - Energy costs and unreliable power
- Financing
- Worker and management skills

Although they use different approaches, studies of best practices and obstacles yield remarkably similar results. Based on these studies one can conclude that at least four factors are important for economic growth: financing, public policies and regulatory climate supporting business, infrastructure and knowledge base. This research focuses on the fourth factor, the knowledge base.

Creation and diffusion of knowledge are important to economic growth. In today's high-tech, global, knowledge-based economy, intellectual capital is increasingly viewed as the single most important asset of organizations and nations. Serious efforts are underway around the world to manage and measure "knowledge" through several major bodies of research, including:

- Knowledge management
- Knowledge transfer
- Organizational learning
- Intellectual capital [6]

Knowledge management focuses on collecting and sharing expertise in organizations. Among the questions addressed in this body of literature are: What knowledge exists in the organization? Who holds that knowledge? How can an organization capture and/or distribute knowledge? Some research focuses on building knowledge databases, i.e., electronic repositories of knowledge in an organization. Among the issues addressed are how to encourage and reward contributions to such a database. Not all knowledge can be captured and stored electronically. In some circumstances knowledge is not easily codified and effective dissemination requires more personal approaches, such as mentoring [11]. The bulk of the research to date in this area focuses on large organizations. Issues surrounding knowledge management in SMEs are not clear.

Knowledge transfer is the diffusion of technical information and expertise. At the macro level this research focuses on information flows among nations, regions, and organizations. Much research in this area is on knowledge gaps between developing and developed countries. Ciolek developed an interesting approach to knowledge network research using the AltaVista search engine to uncover information connections among countries in East Asia [4]. At a more micro level, within organizations the emphasis is on how knowledge moves through an organization. There is a difference between knowledge and information: information can be readily transferred, knowledge cannot. It can be difficult and slow transferring knowledge from one person to another [6]. Increasingly researchers have begun to recognize the importance of human resources in technology transfer, i.e., the capacity of the labor force to use, improve and innovate using technology [14, 20]. Investments in education, training and lifelong learning are needed to develop the knowledge base of the employees. Research is needed to help establish priorities for public investments in education. A second area for research in this area is on the knowledge networks used by SMEs – what are their sources of information and talent? How do they validate information?

Research on *organizational learning* focuses on attributes of organizations and individuals that enable the institution to innovate, adapt to new situations, and take advantage of new opportunities. Knowledge is central to innovation, both in terms of knowledge stock and knowledge flows [2]. Although much research in this area focuses on innovation, innovation may not be critical for economic growth. Vinig et al claim that Taiwan's success in the computer industry was achieved despite the lack of a knowledge base by using a "fast follower" strategy, as opposed to focusing on innovation [18]. Research is needed on the differences in innovators and fast followers.

Intellectual capital is a measure of knowledge in an organization. Although intellectual capital is a major determinant of a company's future earnings potential it is not reflected in traditional accounting practices [6]. Intellectual capital is part of what investors buy when they purchase shares through an IPO or when they invest in companies that have yet to earn a profit [3]. According to Buckley "intellectual capital is an unrecorded asset, which means that although it is something of value, it is not recorded anywhere on a company's financial statements. Copyrights, trademarks, brands, staff and research and development are all examples of intellectual capital" [3, p.1]. The U.S. Securities and Exchange Commission is reviewing issues surrounding the disclosure of intellectual property. Some believe that disclosure will be beneficial

because it may cause people to stop viewing knowledge and IT as costs, and to start viewing them as assets of measurable value to the organization [9]. An interesting related issue not yet addressed in the literature is outsourcing, and the potential long-term impacts of choosing not to build in-house expertise in certain areas.

Research Questions and Research Projects

Although the knowledge base is critical to economic growth, many issues in knowledge management and knowledge networking have yet to be addressed at both the macro and micro levels [see Table 4].

TABLE 4
Research Issues

| | <u>Knowledge base</u> | <u>Knowledge transfer</u> |
|--------------------|--|---|
| <u>Macro level</u> | education training lifelong learning R&D investments policies | knowledge networks technology transfer |
| <u>Micro level</u> | knowledge gaps specific needs in SMEs priorities projections obstacles to progress decisions to outsource | sources of information and knowledge diffusion of knowledge validating information |

Specific questions to be addressed include:

1. What are the characteristics of the knowledge base needed by SMEs? How does this knowledge base differ from what was needed under the traditional economic growth model? What are the implications for education, training and lifelong learning?
2. Do managers/owners of SMEs view the knowledge base as an obstacle to progress? If so, what specifically are the barriers to progress (language, general knowledge of IT, networking, databases, the internet)?
3. What is the best way to build the needed knowledge base? In-house training? Outsourcing? What are the long-term consequences of outsourcing? If the organization chooses not to build its own IT knowledge base, will this affect its ability to quickly adapt or take advantage of new opportunities in IT?
4. How can we build a sensible research agenda balancing the extremely different circumstances in developing and more developed countries? Does the needed knowledge base differ in developed and developing countries?
5. Does the needed knowledge base differ for innovators and fast followers?
6. Do the needs for intellectual capital change over the life of an SME?
7. What knowledge networks exist for SMEs? What are their sources of information?
8. Several researchers have pointed out that there is an asymmetry in terms of who can participate in the new economy (the haves and have nots). This asymmetry is cited as a problem in India [18] as well as in countries that are widely viewed as models, such as Ireland [16]. How can education, training and lifelong learning address this asymmetry?
9. One of the concerns with the Internet and web today is that there is so much information available, not all of which is reliable. When SMEs use the Internet, what sources do they use and how do they validate the information obtained from those sources?

In order to address these issues, three major streams of research are underway. First, surveys of SME managers will capture perceptions of the knowledge base as it exists and as it should be. These surveys focus on segments of the SME population viewed as having the greatest potential to contribute to economic development (e.g., high-tech organization or firms that serve more than local markets). Specifically this study will help determine whether the knowledge base is perceived as an obstacle to progress, whether there is consistency in priorities and projections for developing the knowledge base, and how SMEs acquire knowledge and expertise (e.g., sources of information, outsourcing versus in-house development).

Second, case studies are proposed in two areas: (1) longitudinal studies to observe the consequences of outsourcing IT and to determine how/whether intellectual capital needs change over the life of the business, and (2) studies of successful SMEs to collect information on best practices in the areas of intellectual capital management and information access and validation.

Third, at the macro level using online data sources (search engines and databases), information will be collected about country-to-country knowledge networks and sources of information. Using Alta Vista and other search engines we will identify sources of information in Eastern and Western European countries to determine whether differences exist in knowledge networks of the regions. At the macro level we also plan to conduct studies using benchmark data from “successful” countries as a basis for comparison with countries or regions attempting to develop knowledge-base economies.

This research agenda will provide new information on characteristics of the knowledge base needed in today’s economy. Answers to the questions above may assist policy makers, educators, and business leaders in developing programs and priorities to assist SMEs in becoming true growth engines in the new economy.

References

1. Barton, C. and M. Bear “Information and Communications Technologies: Are they the Key to Viable Business Development Services for Micro and Small Enterprises?” Micro enterprise Best Practices Report on USAID Project contract number PCE-0406-C-00-6004-00.
2. Bontis, N. “Managing an Organizational Learning System by Aligning Stocks and Flows of Knowledge”, *Academy of Management Proceedings* 1999, ppJ1-J6.
3. Buckley, E. “The Hidden Value of Intellectual Capital” *The Industry Standard: Intelligence for the Internet Economy* <http://www.thestandard.com> April 24, 2000.
4. Ciolek, T.M. “Networked information flows in East Asia: A pilot study on research uses of the AltaVista search engine” <http://www.ciolek.com/PAPERS/easian-info-flows.html> 9 pages.
5. Dedrick, J.L., S.E. Goodman, and K.L Kraemer “Little Engines that Could: Computing in Small Energetic Countries” *Communications of the ACM*, 38(5), pp. 21-26.
6. Denning, S. “What is Knowledge Management?” Background document to the World Development Report, October 11, 1998
7. Ein-Dor, P, M.D. Myers, and K.S. Raman “Information Technology in Three Small Developed Countries” *Journal of Management Information Systems* 13(4), pp.61-89.
8. Einhorn, B. “In Search of New Growth Engines,” *Business Week* November 29, 1999, pp. 68-74.
9. Gifford, A. “Software value still great unknown to many firms” *New Zealand Herald* 16 May 2000, C2.

10. Grava, L.N. and S. Putnina, "Improving Latvia's Business Environment" *Transition*, April 2000, pp. 18-19.
11. Hansen, M.T., N. Nohria and T. Tierney, "What's your strategy for managing knowledge?" *Harvard Business Review* Vol 77, issue 2, March-April 1999, p. 106-
12. Heeks, R.B. "Software Strategies in Developing Countries" *Communications of the ACM* Vol 42, no 6, June 1999, pp.15-20.
13. Hudson, Ray "What makes economically successful regions in Europe successful? Implications for transferring success from west to east" Economic Geography Research Group Working Paper Series, EGRG Working Paper 99/01.
14. Jegathesan, J., A. Gunasekaran, and S. Muthaly "Technology Development and Transfer: Experiences from Malaysia" *International Journal of Technology Management* Vol 13, no.2, 1997, pp.196-214.
15. Lyytinen, K. and S. Goodman "Finland: The Unknown Soldier on the IT Front" *Communications of the ACM* Volume 42, No. 3, March 1999, pp. 13-17.
16. Norton, R. "The Luck of the Irish" *Fortune* November 18, 1999, pp.124-135.
17. Pfeffermann, G.P. and G. Kisunko "Perceived Obstacles to Doing Business: Worldwide Survey Results," IFC Report, February 3, 1999
18. Vinig, T., R. Blocq, J. Braafhart, and O. Laufer "Developing A Successful Communication Technology Industry: The Role of Venture Capital, Knowledge and the Government," *Proceedings of the 1998 International Conference on Information Systems*, Helsinki, Finland, pp. 197-206.
19. Watson, R. "The Great I.T. Race: New Zealand lags well behind Finland" *University of Auckland Business Review* Volume 2, No. 1, 2000, pp. 66-77.
20. Williams, T. "New Technology, human resources and competitiveness in developing countries: the role of technology transfer," *The International Journal of Human Resource Management*, December 1996, pp 832-845.
21. World Development Report Knowledge for Development published for the World Bank by Oxford University Press, 1998/99.
22. Ziacik, T.L. "Surveys Help Improve the Business Climate in Estonia" *Transition* April 2000, p. 17.

