Management Skill Requirements For Electronic Commerce:
A "Business-Centric" Approach[1]

Catherine Hajnal, chajnal@unbsj.ca
Charles Davis, cdavis@unbsj.ca
Faculty of Business
University of New Brunswick - Saint John

Adoption of the technologies and business models associated with Electronic Commerce pose significant management challenges to firms because of the relatively large increments of technological and organizational change involved. Possession of business skills as well as technology skills by the firm is necessary for successful adoption of Electronic Commerce practices. However, the specifics of the necessary skill set, and in particular the management skill set, for Electronic Commerce remain unclear. This paper reports some results of interviews, analysis of job descriptions, and literature surveys to explore the question of what management skills are needed to derive business value from Electronic Commerce. We identify an emerging demand for a "business-centric" approach to development of management skills for Electronic Commerce in firms, distinguished from prevailing "technology-centric" approaches.

Introduction

Changing information technologies have profound impacts on the composition of labor force skills and on the configuration of skills within occupations. For many years, scholarly and popular attention concerning the labor force effects of information technologies focused primarily on the dynamics of deskilling and job loss as the most susceptible or "simplest" manufacturing and administrative tasks were automated. Skills-related polarization of the work force remains a serious policy and ethical issue. However, today's versatile and volatile information and communication technologies (ICTs) go far beyond automation to trigger massive reconfiguration in the processes, networks, and scope of businesses, creating demands for new configurations of skills. Processes of "upskilling" are common in knowledge-intensive industries, which typically experience high employment growth rates, and some traditional occupations experience strong upskilling pressures as well (Colecchia and Papaconstantinou, 1996). An insatiable demand has developed for ICT-related technical personnel, and in U.S. the top three occupations in terms of anticipated employment growth between 1996 and 2006 are computer scientists, computer engineers, and systems analysts (Silvestri 1997). However, the extent and significance of ICT-induced changes in skill and occupational structure can no longer be understood primarily in terms of loss of less-skilled jobs on the one hand and mushrooming demand for technical skills, on the other. Associated with the much-remarked shortage of technical human capital in firms are changes in the roles of managers, who are increasingly called upon to perform as organizational designers, coaches, and teachers, and who are expected to lead the process of business value creation through management of investments in human capital and knowledge assets. Thus we see an emerging demand for people in management without deep technical expertise but with cultural knowledge, organizational and social skills, and a specific skill set related to use of information technologies for business purposes. In cases in which ability to exploit new technology is a core competency, technical skills and new management skills overlap and hybridize. This appears to be the case with Electronic Commerce.

Knowledge-intensive industries in which technical skills have historically predominated have had to quickly compensate through hiring of management generalists, while the reverse is

---

true in traditional generalist industries undergoing rapid technological deepening. In Canada, for example, in two highly technology-based service sectors (telecommunication carrier services and computer services), rate of recruitment of college graduates of management, commerce, or other social science or humanities programs greatly exceeded recruitment of engineering graduates in the decade 1986-1996, although in banking and financial services, a traditional bastion of commerce graduates, the reverse was true (Hansen 1998).

Some of the defining characteristics of skill sets and occupations in a "knowledge economy" are becoming clear. A key feature is lifelong learning, which is as crucial for national economic performance as it is for individual economic survival (Lundvall 1996). Lifelong learners can be expected to change jobs regularly or frequently, and as electronic markets lubricate job mobility, the phenomenon of free agency may become pervasive (Davis and Meyer 1998). Outsourcing of technologically volatile information technology services has already induced a huge population of free agent technical consultants who live near airports and spend most of their time on the road. New ICT-related jobs and occupations have proliferated very quickly, requiring that specialist HR firms keep track of credentials and remuneration on a day-to-day basis.[2] Firms establish informated HR systems that allow them to maintain and manage a skills inventory, which can be used for purposes of rapid team formation and to understand and actively deploy a firm's core competencies (Klein, Gee, and Jones, 1998).

A further emerging characteristic of knowledge workers in management roles, which we explore in this paper, concerns their skill hybridization. By this we mean not just possession of the general management skills that are on everyone's laundry list of desired knowledge-worker skills (team player, creative, flexible, etc.) but also unusual combinations of contextual, tacit, and technical skills – combinations of know-what, know-how, know-why, and know-who, to use Lundvall and Johnson's taxonomy (1994) - which permit appropriate firm behavior in complex environments. The complex environments of interest to us concern the transition to Electronic Commerce. Here, the sought-after skill set among managers is not narrow technical expertise but instead a blend of firm- and industry-specific contextual knowledge, general culture, experience, communication skills, and a certain familiarity with technology's use value. Demand for this latter skill component is relatively new in the business community, and the characteristics and features of non-technical management competence in Electronic Commerce have not been well described. In this paper we consider the management challenges raised by the advent of new forms of Electronic Commerce. We analyze an emerging demand for "business- centric" management skills for Electronic Commerce and relate it to efforts to produce appropriate management skills for ICT-intensive business environments.

The Significance of Electronic Commerce

Electronic Commerce refers to an emerging set of business practices and models that successfully exploit the convergence of new information and communication technologies (ICTs) to create economic value. Until the advent of the Web, Electronic Commerce was practically synonymous with Electronic Data Interchange (EDI) and Electronic Funds Transfer (EFT), the first major technology platforms for Electronic Commerce. The stunning advances in ICTs, in particular the emergence and rapid diffusion of computer networking technologies, have enlarged the domain of Electronic Commerce and have greatly increased its saliency in the business community. In contrast with the original focus of Electronic Commerce on ICT-enabled processing of a small set of electronic documents or kinds of financial data among firms, the field of Electronic Commerce now encompasses questions of designing, managing, and deriving business value from a broad range of ICT-enabled internal and external linkages and relationships. Thus conceptualized, "Electronic Commerce" covers a considerable spectrum of contemporary information and communication technologies, most of them volatile and versatile,

---

[2] For example, Mougayar (1996) has identified over one hundred Web-related jobs.

with applications in most industries. Web technologies have been the obvious trigger and business driver of post EDI/EFT forms of Electronic Commerce.

Expansion of Electronic Commerce is leading to the emergence of "an interconnected and borderless venue for marketing, buying and selling, virtual manufacturing, for the delivery of services, and for managing relationships between producers and suppliers, wholesalers, and distributors" (Bachula 1997). In only four or five years, a vast electronic "marketspace" comprised of some 120 million WWW users has emerged. This marketspace increasingly supports not simply commercial transactions but also many pre- and post-sales relationships, making some value chains virtual and complicating the management of traditional ones (Rayport and Sviokla 1995). Although forecasts of the future economic importance of Electronic Commerce vary widely, nearly every observer believes that Electronic Commerce is set to explode, with total value of business-to-business, business-to-consumer, e-commerce hardware and services, and ISP-related services totalling US$250B by the year 2000, a nearly 20-fold increase from 1996 (OECD 1997).

Skills for Generating Business Value from Information Technologies

IT management researchers identify five progressively larger units of ITC-induced business transformation (Venkatraman 1994). The simplest kind is the isolated, incremental application that permits localized exploitation of a particular technology. Incremental application of computers was historically applied to automation of already-existing easily specifiable organizational routines, displacing unskilled labor. The next level of complexity concerns internal integration of IT applications, permitting a degree of coordination and cooperation within the enterprise. Enterprise Resource Planning applications such as PeopleSoft and SAP are examples of software packages that permit integration across business functions. These and other IT applications also permit reengineering of business processes, involving "thorough re-evaluation of the enterprise value-chain and the production process, and [relatively] far-reaching change" (Clarke 1994). Most accounts of intra-enterprise integration and business process re-engineering initiatives report low success rates. The fourth level of ICT induced change, business network reconfiguration, involves ICT-enabled reconfiguration of the "scope and tasks of the business network involved in the creation and delivery of products and services. Coordination and cooperation extend, selectively, beyond the enterprise's boundaries" (Clarke 1994); and the fifth level, business scope redefinition, involves "migration of functions across the enterprise's boundaries, to the extent of changing the organization's conception of the business it is in" (ibid.).

Thus all but the simplest applications of ICTs involve increasingly greater increments of organizational and technological change, with associated risk and uncertainty. Abundant evidence exists in the management and trade literature of the difficulties experienced by most firms to effectively manage and extract business value from relatively small increments of ICT-induced change. We hypothesize that because Electronic Commerce requires concurrent reconfiguration of internal business processes and external business relations, all while dealing with volatile and relatively unfamiliar technologies and business models, it will represent a larger rather than a smaller discontinuity in business practices, entailing some risk. Risk comes from uncertainty about the functionality of the technology as well as from uncertainty about the business value that it may generate. In the case of Electronic Commerce, frequently-cited sources of risk and uncertainty include: the unpredictable reliability and lifetime cost of a particular technology, the lack of standardization or consumer acceptance of key components of Electronic Commerce such as electronic payment systems, the need for technological synchronization and interface compatibility with suppliers and customers, the unfamiliarity of new business models, and the problems and costs involved in linking new IT systems with older legacy systems. As greater numbers of firms learn to use a technology, its growing familiarity confers no declining business advantage. It becomes a necessary but not sufficient condition of business success, like basic telephone or fax service today.

Firms appear to be underestimating the complexity of Electronic Commerce, identifying it with adoption of a discrete technology such as e-mail, bar coding, or smart cards. Canadian firms consider that the three most important barriers to implementation of Electronic Commerce are the cost of the technology (65% of firms surveyed), lack of knowledge about applications (56%), and uncertainty regarding benefits (56%). A minority of firms considers that Electronic Commerce is too complex (31%) or that it exceeds the employees' skillset (44%) (Statistics Canada 1998: chart 6).

Our view is that firms seeking involvement in Electronic Commerce, especially involvement that that implies business network redesign or business scope redefinition, require a significantly higher degree of technological fluency and a bolder approach to experimentation with unfamiliar business models than their less innovative peers. Typically, successful exploitation of Electronic Commerce will require making a creative link between an organization's strategy and the technology that supports it, and managing pervasive ICT applications that change very quickly, that are increasingly integrated and convergent, and that enable flexible and adaptive behavior on the part of the firm and its employees. These skills and this behavior are necessary in any firm seeking to establish itself in Electronic Commerce and are not the sole province of high technology firms or firms that produce technology for other firms to use.

Ability to successfully assimilate and exploit advanced information and communication technologies ahead of the industry curve requires that a firm possess two distinct skill sets. One is a technical skill set supplied by technologically competent ICT specialists who are generally located in the "technical core" of the firm (Quinn, Baruch and Zien, 1997). This technical core must be constantly renewed and refreshed. Around the core are the firm's management and administrative functions, which provide internal coordination and link the firm to its business network. These functions embody the tacit business knowledge of the firm, but not the firm's technology-related operational skills. The legendary problem of aligning the firm's technical capability with its business strategy arises in part through the mutual inability of the technical workers and management workers to understand each other's objectives and processes. The problem of the IT-business strategy disconnect has been regarded as serious for the past two decades, and it is considered by CIOs to be the number one IT management problem (Ernst and Young/CIO 1998).

Awareness is mounting in the business community that intensive use of ICTs goes hand in hand with transformation of business models and processes. Thus attention is shifting to ways of developing a management and technical skill set that is capable of generating business value from the firm's information and communication technology assets in conjunction with its other assets. Successful firms use overlapping business and technology skills to search for and experiment with combinations of technology and organization to produce value in the electronic marketspace.

In summary, the transition to Electronic Commerce may pose significant (but largely underestimated) challenges to management, which needs to know how to properly combine business skills with technology skills to generate value from ICT investments. However, the specifics of the necessary skill set, and in particular management skills, for electronic commerce remain undefined. In the next section we discuss the skills that executives believe firms to need to derive business value from Electronic Commerce, suggesting an emerging business-centric approach to provide Electronic Commerce management skills to firms.

Identifying Electronic Commerce Management Skills

We undertook several sets of interviews with sponsors, industry associations, students, and domestic and foreign experts to ascertain the nature of the needs for training in Electronic Commerce, using four sources of information for qualitative analysis. The first involved a series of phone interviews conducted with a broad sample of Electronic Commerce users. EC World (1997) published a list of 146 Industry Associations identified as users of Electronic Commerce. We broke down the list based on the North American Industry Classification System (NAICS), which is replacing the Standard Industry Classification (SIC) system. For this initial round of data collection, the goal was a purposeful sample to get breadth in coverage by avoiding duplication of industry representation. The process resulted in 61 of 146 associations being candidates for contact. Through phone calls and email requests, we were able to communicate with 26 associations.

A second source of information was provided via interviews with academics who were either offering more than two electronic commerce courses in their program or who had indicated Electronic Commerce as a main area of teaching and research in the ISWorld Faculty listing. Identifying two or more courses in electronic commerce was based on web searches for electronic commerce programs. As a starting point we used the list of electronic commerce courses produced by ISWorld. Fifty-three academics from around the world were contacted, and twelve responded.

A focus group was conducted with representatives from organizations in the Maritimes region of Canada, recognized as local leaders in their use of electronic commerce. The topics of discussion were electronic commerce jobs in the respondent firms, as well as the panel members' thoughts and experiences regarding needed skills for electronic commerce.

A final source of information was a search in several employment web sites such as Mosaic. We identified a several hundred jobs which had management or business and electronic commerce components. These jobs were reviewed for their skill requirements.

What Skills do Firms Want in Electronic Commerce?

The demand for Electronic Commerce skills varies across industries because of different degrees of involvement in present and prior forms of e-commerce. Industries with active interest in Electronic Commerce include the mining industry and its equipment supplier industries; engineering firms; the banking and financial industry; the air transportation industry; marketing agencies; university registrars and admissions officers; food wholesalers and retailers; tax administration agencies; media content providers; publishers; healthcare services; information services; travel service providers; and brokers of many sorts. In general, industries or segments of industries whose product is already in "bit" form (i.e. anything that can be digitized) are more aggressive about Electronic Commerce than firms dedicated to manipulation of molecules of matter. Some of the latter became involved in Electronic Commerce in the 1980s through EDI and supply chain re-engineering, and now must assess the need to move to post-EDI forms of Electronic Commerce.

We found two principal kinds of demand for Electronic Commerce skills. The vast majority of positions with the term "Electronic Commerce" in the job title are technically oriented, requiring formal technical training and information system skills for EC/EDI managers and Web technology skills for website or network managers and coordinators. These are the skill sets largely produced by university MIS departments or vocational technical Electronic Commerce training programs. Most positions require a few years of experience. We call this the "technical" Electronic Commerce skill profile. The second kind of sought-after Electronic Commerce skill set concerns positions for senior strategists, relationship managers, sales,

marketing, and customer service people. We call this the "management" Electronic Commerce skill profile.

These two sets of skills reflect two different approaches to Electronic Commerce. The "technical" Electronic Commerce skill profile is emphasized in industries already involved in implementation of EDI technologies, especially those concerned with the transport of physical goods (mining, manufacturing, and transportation) or in industries concerned with automation of paper flow associated with receipt, distribution, billing and payment. This approach regards Electronic Commerce as a form of paperless office or computer-based office automation. It appears to be the approach taken by MIS departments, which emphasize the analytical skills needed to assess and streamline paper-based processes and the technical skills required to manage reengineering projects and information systems as essential Electronic Commerce management skills. University respondents within the discipline of MIS who are active in Electronic Commerce tend to emphasize technology and its role in streamlining paper-based processes.

Those who approach Electronic Commerce in terms of service delivery or business network improvement regard Electronic Commerce primarily as ICT-supported linkages with business partners and allies, involving shared information, inter-firm integration, and interfaces with clients, particularly through customer service. This approach places heavy reliance on the skills required for intra- and inter-organizational networking, teambuilding, and relationship management. It emphasizes the novelty of the opportunities created by Electronic Commerce to link organizations not previously regarded as partners to provide products and services. For these positions, industry-specific knowledge and ability to imagine business systems, processes, and networks in terms of business models and their possible technological underpinnings are prized skills. Providers of intangible services seem sensitive to the potential value of sharing information across broadly defined business partnering arrangements.

Few respondents expect "Electronic Commerce" positions to be entirely new positions or exclusively devoted to management of some new thing called Electronic Commerce. Instead, they consider that a range of existing positions will incorporate skills, roles, and responsibilities associated with Electronic Commerce. Table 1 shows examples of technical and business-centric "Electronic Commerce" positions provided from interviews and conversations with observers from industry and academia.

The list of positions requiring primarily technical skills contains no surprises. However, the list of Electronic Commerce positions requiring primarily business management skills is surprising because it contains a variety of managerial and senior executive positions that are not ordinarily considered to fall into the domain of "Electronic Commerce": for example, CEO, dean, registrar, senior executive. It is also surprising that industry observers consider the position of CIO to be one that requires primarily business management skills rather than technical skills. Table 2 contains a list of the business-centric Electronic Commerce skills identified by industry respondents.

The general management qualities desired of non-technical Electronic Commerce managers are familiar by now: ability to work in a group, willingness to learn, appropriate attitude, etc. However, the nature of the "non-technical technical knowledge" a manager must take into the Electronic Commerce battlefield is unclear. Judging from the remarks of observers in individual and focus group interviews, it involves a certain familiarity with the technology of information systems, databases, the Internet and the World Wide Web, EDI, non-EDI business-to-business e-commerce systems, interactive marketing, E-payments, electronic aspects of retailing, telecommunications, security, project management, business communications, and marketing in a computer-mediated environment.

The nature of the knowledge-of-technology skills remains to be clarified. Observers put forward three conjectures to explain the tentativeness of their views on the hybrid management-technology skill set for Electronic Commerce. The first is that Electronic Commerce managers are being recruited from the IT field, and that practitioners do not agree about the amount and nature of technical skills that are critical for a manager to possess. The second is that industries are in a state of transition, moving away from IT dependency and towards a renewed focus on business processes, and that this change requires non-technical managers to learn something about technology. The third conjecture is that we are seeing a composite sketch of the needs in Electronic Commerce management. If we focus on only one job title in one industry, we would see a much clearer picture of the skills needed. At any rate, there is some agreement that non-technical Electronic Commerce business people, people who are aware of technologies and their relative business value, are ahead of industry trends and that this accounts for the paucity of non-technical Electronic Commerce job titles in the on-line employment services. According to this view, although the current demand in Electronic Commerce is for technical IT skills, "business-centric" e-commerce management skills are part of the next wave of essential skills and knowledge required for firms in a digital economy.

Representatives in some industries emphasize that needs are difficult to measure because of the tendency to outsource information technology, data processing, and technology management activities. In other words, industries that distance themselves too much from information technology issues and place them in the hands of consultants and contractors cannot assess their own needs.

Electronic Commerce issues are appearing in unexpected places. For example, a movement is afoot among educational institutions in North America to create seamless record keeping and record access from primary through post-secondary education. Educational records management and enrolment management are increasingly important issues in a transient society, and governments increasingly require more data for administrative purposes, increasing the complexity of reporting systems. The Post-Secondary Electronic Commerce Standards Council (a coalition of education associations and vendors) is championing expansion of Electronic Commerce solutions in educational administration.

Strong concern is being shown about the degree to which legislators have erred in the assumptions made about how quickly electronic payment systems and Electronic Commerce business readiness can be effected. Nine thousand of the 25,000 Florida businesses legislated to do business on-line with the state tax service have come on board; the belief is that the remaining 14,000 never will, unless technology is dramatically simplified. The remittance-submitting or benefit-receiving public is in even worse shape. Skill improvement is regarded as the best approach to this problem.

In summary, it is not easy to specify the Electronic Commerce management skills required by firms, and this is largely because most firms are not sure how to specify these management skills themselves. The general management skills and qualities desired for Electronic Commerce managers are not very different from those desired for other managers. These tend to be idealized skills and qualities possessed by senior managers. The specific technological skill set or technological knowledge required for effective management of Electronic Commerce is still relatively undescribed. This is because the search for "business-centric" Electronic Commerce managers is relatively new. If Electronic Commerce assumes the revolutionary proportions that some foresee for it, we can be sure that the search for Electronic Commerce management skills will become urgent.

Developing the Electronic Commerce Management Skills: A Business-Centric Approach

Innovation and adaptation of technologies are critical performance points for managers. The skills to select, adopt, and adapt technologies are more than technical. They involve strategy, awareness, and organizational change management. This message is abundantly repeated in the information technology trade literature, and it is especially directed to information technology professionals who are constantly urged to become more attuned to users' needs, develop stronger communication and group work skills, learn and understand the vision of their employer, and so forth.

The legendary disconnect between the IS department and the rest of the firm has sparked a remarkably active group of theories about how to achieve alignment between IT and business goals, and a stream of management remedies that has grown into a torrent with the spreading realization of the strategic importance of Information Technology. However, the prevalence of technologically illiterate managers and business-illiterate IT personnel has not made it easy to produce business value from investments in information technology. One of the remedies has been to cultivate hybrid competencies. This is the emerging pattern in Electronic Commerce as well, although most of the key questions about hybrid configuration of skills remain to be answered. Peter Keen (1991) has identified two hybrid business-IT roles. One he calls "Development Support" in which IT professionals acquire adequate business skills. The other he calls "Business Support" in which business professionals acquire adequate IT skills. This is the kind of competency that business executives are currently calling for. Figure 1 shows these new career trajectories. In the "business-centric" approach to Electronic Commerce, individuals with business skills and acumen acquire adequate technological knowledge to manage, for example, IT-related business ventures having to do with product development, packaging, marketing, support, and enhancement (Keen 1998). Individuals with technical backgrounds may arrive in the same positions but via a "techno-centric" career trajectory.

Electronic Commerce is a quickly moving target whose boundaries are not well defined. It affects firms and institutions in such a variety of ways that the management training needs in this area are heterogeneous. In other words, a single Electronic Commerce curriculum will not be adequate or stable. The curriculum will need to be frequently updated and adapted to the circumstances of the user industry.

The technical background of managers is closely related to their entry points, responsibilities, ideal competencies, and career trajectories in firms. The most clearly established career pattern for managers of technological change is that of the technologically competent individual who moves from a technical position to a management position after five to seven years of work experience. This is an example of the movement into section 4 of figure 1. Such individuals frequently seek management education at the MBA level. The nearly 300 "Techno MBA" programs in North America, in which individuals with technical backgrounds take an MBA after several years of work experience, cater to the career needs of individuals trained in information technologies who aspire to management positions.

However, the "Techno MBAs" do not address the needs of firms for entry-level human resources that possess hybrid business and technical skills (sections 1 and 2 of figure 1), nor do they provide the needed training for managers in traditionally non-technical functions who find themselves working on large scale information technology initiatives (section 3 of figure 1.) An emerging trend is to provide a level of technological competency to business students in traditional business disciplines (accounting, human resources, organizational behavior, etc.). At an undergraduate level this would reflect the entry into section 1 of figure 1 and at a graduate level, section 2. Although many firms say that they prize generalist business skills, the entry points into the organization for such people are not as clearly observable as they might be.

Furthermore, the provision of business skills to technologically competent people has received much more attention than the provision of analogous technical skills to persons trained in business disciplines. Here the aim is not to produce experts but rather to produce people who are conversant enough with the technologies and familiar enough with their purposes and functions to work with the technologically active sections of a firm. They may end up playing the role of demanding end user in one of the business units of a firm.

A further complication concerns the distribution of Electronic Commerce skills within work groups. According to many accounts, the critical variable in Electronic Commerce success is not the possession of proper skills in a collection of individuals but the proper skills and competencies of a *team*. This requires not just proper attitudes and management approaches but also the deployment of the right set of skills within the group. An example in the trade literature concerns a failed attempt by a grocery store to establish an Internet commerce site. The store's planning and implementation team included no one who could study the customer base, understand the demographics of online shopping, and design the site with the characteristics of the customers in mind (Mohan 1997).

In conclusion, the novelty and rapidity of Electronic Commerce have created demand for quick learners with some or many technical skills but also with unusual motivation, group skills, business acumen, and a user orientation. Developing curriculum initiatives which provide business students with technical familiarity in the realm of Electronic Commerce represents an opportunity to provide organizations with human resources who are ready for the challenge of identifying business opportunities for the deployment of Electronic Commerce. At a graduate level, Electronic Commerce MBA programs foster managers ready to consider the strategic use of Electronic Commerce technologies. At an undergraduate level, students assuming the entry level positions in organizations will posses skills which enable them to see opportunities for process innovation, relationship-building, and internal and external alliance formation in technology deployment.

References

Bachula, Gary R., Acting Under Secretary for Technology, U.S. Department of Commerce, 1997. Speech at the CALS Award Dinner, Orlando, Florida, October 13. http://www.ta.doc.gov/Speeches/eleccomm.htm.

Clarke, Roger, 1994. "The Path of Development of Strategic Information Systems Theory," http://dossantos.cbpa.louisville.edu/courses/imba/strategy/

Collechia, A., and G. Papaconstantinou, 1996. *The Evolution of Skills in OECD Countries and the Role of Technology*. STI Working Paper 1996/8, OECD, Paris. http://www.oecd.org/dsti/sti/prod/wp_8.htm

Davis, Charles H., Catherine Hajnal, Dan DeMatteis, and Mark Henderson, 1998. *Management Skill Requirements for Electronic Commerce*. Report prepared for Industry Canada, March.

Davis, Stan, and Christopher Meyer, 1998. *Blur. The Speed of Change in the Connected Economy*. Addison-Wesley, Massachusetts.

EC World, 1997. "North American Electronic Commerce Associations", June, pp. 52-53

Ernst & Young/CIO magazine, 1998. *An Organizational Look at the Information Executive 1997*. http://mis.miningco.com/msub11.htm

Hansen, Wendy, 1998. "The Transition of the Skill Base of the Work force in Three Service Sectors. A Decade of Change, 1986-1996". MERIT, Maastricht, June, draft.

Keen, Peter G., 1998. "Systems: Not Just a Job, it's a Venture," http://www.peterkeen.com/cworld16.htm

Keen, Peter G., 1991. *Shaping the Future. Business Design Through Information Technology*. Harvard Business School Press, Cambridge, Mass.

Klein, Jeremy, David Gee, and Howard Jones, 1998. "Analysing Clusters of Skills in R&D – Core Competencies, Metaphors, Visualization, and the Role of IT", *R&D Management* 28(1), 37-42.

Lundvall, Bengt-Ake, 1996. *The Social Dimension of the Learning Economy*. Alborg University, Denmark.

Lundvall, Bengt-Ake, and Johnson, B., 1994. "The Learning Economy", *Journal of Industrial Studies* 1(2), December, 23-42,

Menzies, David, 1997. "Are You a Modern Purchaser?" *Modern Purchasing* 38(3), 17-19.

Mohan, Sunichi, 1997. "Building an I-Commerce Team Demands Many Skills," InfoWorld, Sept. 8, http://www.infoworld.com/cgi-bin/displayStat.pl?/careers/970908icom.htm#chart

Mougayar, Walid, 1996. "Internet Human Resource Requirements" *Cyber Review*, http://www.cyberm.com/cr12-hr.html

OECD, 1997. *Measuring Electronic Commerce*. Organization for Economic Cooperation and Development, Paris.

Quinn, James Brian, Jordan J. Baruch, and Karen Anne Zien, 1997. *Innovation Explosion. Using Intellect and Software to Revolutionize Growth Strategies*. N.Y., The Free Press.

Rayport, Jeffrey F., and John J. Sviokla, 1995. "Exploiting the Virtual Value Chain*," Harvard Business Review*, November-December, 75-85.

Silvestri, George, 1997. "The 10 Occupations With the Fastest Employment Growth, 1996-2006", U.S. Bureau of Labor Statistics. http://stats.bls.gov/news.release/ecopro.table6.htm

Statistics Canada, 1998. *Survey of Technology Diffusion in Service Industries*. Ottawa. http://strategis.ic.gc.ca/pics/it/survey.pdf

Venkatraman, N., 1994. "IT-enabled Business Transformation: From Automation to Business Scope Redefinition," *Sloan Management Review* (Winter), 73-86.

Table 1: Electronic Commerce Positions Described by Respondents

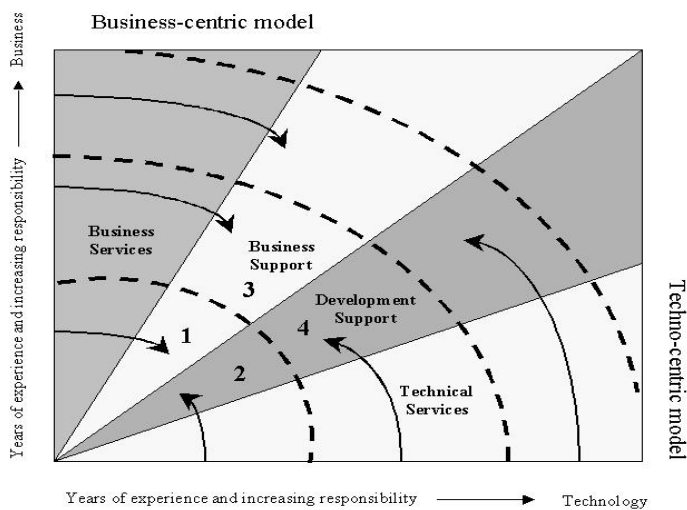| Positions Requiring Primarily Technical Skills	Positions Requiring Primarily Business Management Skills
MIS director, MIS manager	Electronic Commerce Segment Analyst
Y2000 project manager	EC Manager
EC/EDI coordinator	EC project manager
EC project manager	Director, Association Director
EC technology specialist	Researcher
E-commerce site manager	Registrar, Associate Registrar, Financial Aid Officer
On-line business coordinator or manager	Senior Office
On-line operations manager	EC Coordinator
	Traditional marketing/distribution titles
	Webmaster
	Operations manager
	"ringmaster" or relationship manager
	CIO
	Senior manager or senior executive: CEO, President, Vice-President, Dean, Association Dean, etc.

Table 2: Business Management Skills Required By Industry for Electronic Commerce

- Ability to interact in an IT/business work group
- Ability to work with IT professionals, data processors
- Multiple project co-ordination
- Basic understanding of computers from a non-technical perspective
- General management education
- Knowledge of the industry
- Marketing in a one-to-one environment
- Human-computer interaction
- Operations issues (such as product development)
- Strategic analysis (necessary for any emerging market)
- an attitude appropriate for business and "people" management

- A relationship builder
- A marketer
- Charismatic (a leader, enthusiasm generator, problem solver for others)
- Comfortable interacting with government and regulatory bodies
- Open to change
- A fast learner
- A non-technical person's understanding of technological security and perceptions surrounding security
- Ability to contribute to standards of service to constituents
- Able to use IT and telecomm technologies
- Traditional reporting skills
- A broad perspective on Electronic Commerce (familiar with its many technological options)

Figure 1: Emerging Career Trajectories for Electronic Commerce

(Adapted from Keen, 1991)