MANAGEMENT SKILL REQUIREMENTS FOR ELECTRONIC COMMERCE

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Executive summary

Electronic Commerce refers to information technology-enhanced or -enabled trading among companies. Because external integration induces internal integration, intra-firm applications of information and communication technologies (ICTs) such as computer-supported collaborative work and workflow redesign are being brought into the domain of Electronic Commerce, and vice versa.

This report examines the requirements for management skills in Electronic Commerce. It includes a summary of definitions of Electronic Commerce, sample e-commerce business models, and a comprehensive worldwide analysis of university courses and programs in Electronic Commerce. It also includes a selective analysis of Electronic Commerce management training initiatives outside the university sphere.

The problem of generating business value from investments in Information Technology has a long history. The question of management skills for Electronic Commerce is a recent manifestation of a fundamental management challenge for many firms: the challenge of managing technology-related business innovation.

Firms need managers who can work in crossover business and technology environments. From a job design and work organization perspective, firms need to find individual managers with hybrid business/technology skills, and they need to establish and properly use multiskilled, rapid-learner teams. Workers and entry-level management personnel also require specific learning opportunities to function effectively in Electronic Commerce environments.

Universities provide a variety of learning opportunities in Electronic Commerce. The report describes the varieties of programs and the contents of the core Electronic Commerce syllabus as it is emerging in faculties of business around the world.

The section that examines three components of Electronic Commerce (e-commerce uptake by SMEs, business process reengineering/workflow skills, and the transformation of the Purchasing function) provides an overview of the management training needs in these areas, and suggests the range of curricula and delivery mechanisms required to promote management skill development.

The report describes views among industry respondents concerning emerging Electronic Commerce management needs, confirming that e-commerce managers need hybrid skills.

The report closes with some observations on the status of Electronic Commerce management preparation in Canada and provides five suggestions for initiatives to improve skills for managing Electronic Commerce in this country. The proposed initiatives concern skill mapping, sectoral management training programs, a national youth management internship program in Electronic Commerce, and review of the Electronic Commerce-readiness of the Canadian SME support system and public sector management training system.

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Managing Electronic Commerce

Table of contents

Introduction

The significance of Electronic Commerce

Electronic Commerce refers to a set of business practices 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), the first technology platform for Electronic Commerce. The stunning advances in ICTs, in particular the emergence and rapid diffusion of computer networking technologies, have enlarged the meaning of Electronic Commerce and given the term much greater saliency in the business community. At present “Electronic Commerce” typically encompasses a fairly wide spectrum of contemporary information and communication technologies, which we describe later in this report.

The risk of focusing attention on the present technology platform of Electronic Commerce is that one may lose sight of the central goal of technological and organizational innovation in Electronic Commerce. The goal is to create “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 other words, to create a vast -- if not global -- electronic “marketspace” in which not simply commercial transactions but also many pre- and post-sales relationships are supported by information and communication technologies.

A decade ago, when EDI and its supporting technologies provided the platform for Electronic Commerce, this sort of universal goal was unthinkable. It is, however, becoming a realistic and feasible goal from the perspective of technologies that are currently available.

Many observers believe that "as the 21st century approaches, Canadians face challenges in technology and information that are as profound as those of the Industrial Revolution” (Speech from the Throne, 1997). The ICT-induced transformation of the world economy is very serious business for all firms and countries because it represents a major discontinuity in business practice triggered by technological change, a Schumpeterian wave of creative destruction that will undoubtedly reshuffle the deck of economic prosperity.

One of Canada's stated goals is to make the country a world leader in Electronic Commerce by the year 2000 (Lynch 1998). This goal is based on the recognition that foundations of competitiveness in a knowledge (or virtual) economy will be very different from those in a manufacturing or service economy. The most obvious and commented-upon difference is that in the knowledge economy, competitive firms are distinguished less by how they manage physical flows and more by how well they use the skills of "knowledge workers" to deliver value to customers, suppliers, and business partners. In a knowledge economy, ICTs are the equivalent of a company's nervous system or knowledge network. The key variable in the competitiveness of a "knowledge-based" firm is its comparative ability to use new information and telecommunications technologies for purposes of internal and external coordination and innovation of distinct value-added products, services, and processes.

What are the best ways for a firm to learn to compete in the "knowledge economy"? Mastery of new technology can confer business advantages that non-adopters cannot hope to enjoy. However, from a technology user's point of view, it is clear that the newer and more complex the technologies, the riskier the business venture. Risk comes from uncertainty about the functionality of the technology as well as from uncertainty about the business value that it may generate. Furthermore, as greater numbers of firms learn to use a technology, it becomes so familiar that it confers no particular business advantage. Then it becomes a necessary but not sufficient condition of business success, like basic telephone or fax service today.

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. This technical core must be constantly renewed and refreshed. Around the core are the 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-dependent 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. This problem has grown so serious that numerous programs have been developed to provide hybrid management-technical training. Increasingly, awareness is mounting that the 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 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

these two skill sets to deliberately search for and experiment with combinations of technology and organization to produce value in the electronic marketspace.

Typically, successful exploitation of Electronic Commerce requires 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.

The transition to Electronic Commerce poses significant challenges to management. This report examines some of the emerging initiatives in the university sector to provide Electronic Commerce management skills to firms. We also provide a selective overview of the world of management training for Electronic Commerce outside the higher education sector.

Scope of report

The severe bottleneck in Information Technology skills in North American industry has attracted much more attention among policymakers and human resource professionals than the question of management skills in Electronic Commerce. However, judging from the plethora of books on managing ICT-induced organizational change available in the popular business press, senior managers are eager to learn how to take advantage of these new technologies.

The successful implementation of new technologies requires technical skills and management skills. IT skills are difficult enough to manage because of their short shelf life. However, IT skills are more easily specifiable and replicable than management skills, many of which are specific to an organizational context or industry sector. In recent years, IT-related millenarian anxiety has nurtured a booming business press offering wisdom to managers about how to cope with rapidly changing information technologies. An important management skill these days is the ability to assess the reality behind the abundant jargon. The negative reputation earned by the Business Process Reengineering movement in recent years has contributed to a certain skepticism among managers about the effectiveness or appropriateness of trendy management practices or paradigms. Business students react to the prescriptive management wisdom literature by demanding to be shown that some prescribed course of managerial action really does work.

Successful Electronic Commerce firms devise internal means to foster organizational learning to assimilate Electronic Commerce technologies and to experiment with Electronic Commerce business practices. External to the firm, an abundant supply of services exists to enhance the knowledge and skill base of managers in many areas of Electronic Commerce. These services include educational programs offered by institutions of higher education, short training courses offered by a variety of service providers, and events such as conferences and seminars to build awareness about management issues and technological trends.

In this report we present a preliminary examination of the management skill set in Electronic Commerce and relate what is known about its characteristics, origins, location in the firm, and market demand. Our findings are based on experience and information accumulated during the development of the undergraduate and graduate programs in Electronic Commerce at the University of New Brunswick in Saint John (UNBSJ), the outreach experience of the Electronic Commerce Centre (ECC) in Saint John, and Internet-based research. We proceed as follows:

- First, we survey the domain of Electronic Commerce, examining its origins, evolution, technological foundations, and definitions, to better see how it is conceptualized and operationalized.
- Then, we examine the management and strategy implications of Electronic Commerce.
- We identify, describe, and analyze the range of Electronic Commerce management training programs and courses in universities, and provide a rapid comparison with the situation outside the higher education sector.
- We examine three specific Electronic Commerce issues (e-commerce uptake by SMEs, business process reengineering/workflow skills, and the transformation of the Purchasing function) to better illustrate the ways that universities and the private sector are responding to emerging, highly specialized training needs for Electronic Commerce management skills.
- We address the question of industry requirements for Electronic Commerce management skills, based on the results of a variety of individual and group interviews.
- We close with some observations on the status of Electronic Commerce management preparation in Canada and provide some suggestions for initiatives to improve skills for managing Electronic Commerce in Canada.

What is Electronic Commerce?

Understanding a multifaceted technological revolution

Origins of Electronic Commerce

Electronic Commerce, in the form of Electronic Data Interchange (EDI), originated in the 1960's in the United States with independent initiatives in the railroad, retail, grocery and automotive manufacturing sectors designed to strengthen the quality of data they were exchanging with others in the supply chain and using for their internal processes. In the 1970s Electronic Funds Transfer (EFT) over secure private networks among financial institutions expanded the use of telecommunications technologies for business purposes, permitting the development of computer-to-computer exchanges of operational business information in the financial field, specifically the transfer of remittances and payments. EDI uses standardized-format electronic documents that replace common paper business documents such as invoices, bills of lading, purchase orders, purchase change orders, requests for quotations, and receiving advices – the six types of business documents that constitute 85% of the official commercial transactions in the U.S. (Kalakota and Whinston 1997: 376).

EDI implementation has been driven primarily by major sectoral players under the coordinating auspices of industry associations. But the overall adoption of EDI was never as widespread as expected, especially among small and medium-sized firms. The diffusion of EDI has been slowed by the high costs of implementing EDI applications and services, as well as on-going VAN costs, and by EDI's technological complexity, requiring more IT expertise than many smaller companies have in-house.

Moreover, EDI, to be fully effective within a firm, requires the integration of departmental functions and IT systems, such as ordering, inventory and accounting, which often presented a challenge to EDI-enabled companies. Finally, EDI is a company-to-company initiative and does not deal with the business-to-consumer relationship.

Continued demand exists for traditional EDI. Large companies have made substantial investments in EDI infrastructure, have reaped substantial returns

and continue to make substantial new investments. But the telecommunications involved has changed from a primarily VAN-based approach to an Internet-based service and the user interface now more commonly resembles the de facto web browser-like standard. This is why the current demand is for IT solutions that bridge the "time and technology gap" and support EDI as well as Net commerce, while at the same time integrating corporate business systems. Internet EDI (EDI using Internet protocols and networks) radically reduces setup and operating costs while making more trading partners potentially available. The ability of EDI to incorporate the Internet will increase the attractiveness of EDI to an increasingly wider range of trading partners.

Definitions of Electronic Commerce

Today, broad and comprehensive definitions of Electronic Commerce are popular (see Table 1: Definitions of Electronic Commerce). Open-ended definitions of Electronic Commerce encompass an expanding universe of ICT applications within and among firms, including electronic mail, document and workflow, EDI applications in procurement and logistics management, demand-driven manufacturing and retailing, virtual enterprises, and groupware. The OECD has presented a five-level typology of Electronic Commerce definitions: the broadest includes electronic funds transfers and credit card transactions. The second broadest includes the infrastructure that supports Electronic Commerce (service and access providers, equipment manufacturers, etc.); the third broadest encompasses business-to-business electronic transactions, the second level, business-to-consumer without

Table 1: Definitions of Electronic Commerce

Electronic Commerce incorporates “all value transactions involving the transfer of information, products, services or payments via electronic networks" (ITAC, November 1997).

Electronic Commerce “refers generally to all forms of transactions relating to commercial activities, including both organisations and individuals, that are based upon the processing and transmission of digitised data, including text, sound and visual images” (OECD 1997b)

Electronic Commerce “is about doing business electronically. It is based on the electronic processing and transmission of data, including text, sound, and video. It encompasses many diverse activities including electronic trading of goods and services, online delivery of digital content, electronic fund transfers, electronic share trading, electronic bills of lading, commercial auctions, collaborative design and engineering, online sourcing, public procurement, direct consumer marketing, and after-sales service. It involves both products (e.g. consumer goods, specialised medical equipment) and services (e.g. information services, financial and legal services); traditional activities (e.g. healthcare, education) and new activities (e.g. virtual malls).” European Commission (1997)

Electronic Commerce is a generic term to describe the way organisations trade electronically. It uses a group of technologies to communicate with customers or other companies, to carry out research or information-gathering, or to conduct business transactions. Although the Internet is the best known of these, others include intranets, electronic data interchange (EDI) and smart cards. KPMG (1997).

transactions, and the narrowest, business-to-consumer with electronic payments. The scope of these segments will change substantially with technological improvements as, for example, when secure micropayments make widespread consumer involvement in Electronic Commerce possible.

An abstract definition of Electronic Commerce that embraces the increasing virtualization of the three components of a market (agents, products and processes) has been put forward by Whinston, Stahl, and Choi (1997). Agents, products, or processes can be physical or virtual. The eight possible combinations of physical or virtual agents, products and processes allow identification of areas of traditional areas of commerce as well as core areas where "all types of business services and processes have the potential to become digital products exchanged on a digital network" (see Table 2: Physical and Digital Components of Markets).

Table 2: Physical and Digital Components of Markets

Source: after Whinston, Stahl, and Choi (1997)

AGENT (sellers, buyers, intermediaries)	PRODUCT (commodities exchanged)	PROCESS (interaction between agents)	Example of kind of commerce
Physical	Physical	Physical	Traditional commerce
Physical	Physical	Digital	Online sales of physical products – Amazon.com or Virtual Vineyards
Physical	Digital	Physical	In-store sale of digital products
Physical	Digital	Digital	Online sale and delivery of digital products
Digital	Physical	Physical	Floor of a commodities exchange
Digital	Digital	Physical	Floor of a stock exchange
Digital	Physical	Digital	Online auction of physical objects
Digital	Digital	Digital	Core of Electronic Commerce: digital products exchange in an electronic venue with electronic interactions

The advantage of an open-ended definition of Electronic Commerce is that it makes possible the incorporation of emerging and future generations of information and telecommunication technologies into the framework. For example, the convergence of computing, telecommunications, and multimedia is leading to networked interactive multimedia (NIM) based on a technology package that includes fast, inexpensive computers, pervasive "thin client" but highly intelligent appliances, high bandwidth networking in offices and homes, continued interoperability and open standards, and an evolving multimedia user interface (Ticoll 1997). Such a technology package will have major implications for all industries, with special significance for industries with a service dimension or those that trade in information

Table 3: Estimated Present and Future Value of Electronic Commerce

(source: OECD, 1997)

Electronic Commerce activity	Value 1996	Estimated value 2000
Hardware	$US 11B	$US 43B
Internet service providers	$US 125M	$US 12B
Electronic Commerce software applications	$US 22 M	$US 3.2B
Enabling services	$US 1.85B	$US 17B
Business-to-business and business-to-consumer e-commerce	$US .47B (mean) $US .4B (median)	$US 135B (mean) $US 46B (median)

However, expansive definitions of Electronic Commerce do not work for those who must measure its amplitude and distribution. This is the case of policy-oriented statistical agencies. Their requirements for precise definitions of Electronic Commerce must deliberately constrain the scope of analysis. For example, the OECD, in order to measure the amplitude and estimate the structure of demand for Electronic Commerce, was obliged to restrict its definition of Electronic Commerce to "commercial transaction occurring over open networks" (OECD 1997a). This is a "policy driven definition" because the Electronic Commerce policy issues facing the G7 policymakers largely have to

do with using open and unsecured networks for commercial transactions. This definition excludes older forms of Electronic Commerce, notably traditional EDI transactions, newer forms of Electronic Commerce such as wireless applications and multimedia, intrafirm ecommerce applications such as intranets (the most rapidly growing area of Electronic Commerce in 1997), and the Electronic Commerce activities of the public sector, such as defense procurement. Using this restrictive definition, the OECD found that in 1996, one firm (General Electric), did about $US 1B in business that could be called Electronic Commerce, "more business-to-business Electronic Commerce… than all the individual business-to-consumer activities and most of the estimated Electronic Commerce totals" (OECD 1997: 11). Two European firms, a retailer and an automobile manufacturer, did $US 10B and $US 7B respectively in business-to-business Electronic Commerce, but not over open networks. Estimates of the expected spectacular increase of value of Electronic Commerce activities, compiled by OECD, are in Table 3: Estimated Present and Future Value of Electronic Commerce.

In summary, the economic value of Electronic Commerce is expected to rise very rapidly in the next few years. This in itself will provide an incentive to create new forms of business, new products and services, and new channels. However the significance of Electronic Commerce lies not just in the quantity of electronic transactions it enables but also in the economic restructuring it will drive. Electronic Commerce will lead to the virtualization of most segments of industry value chains (Lefevbre and Lefevbre, 1998). This will alter the geography of economic activity and modify the economic landscape.

The technological foundations of contemporary Electronic Commerce

An important issue that arises in educating managers for Electronic Commerce concerns the degree of technological literacy that managers need in order to be successful in an Electronic Commerce environment. We are not referring to basic computer literacy but rather to familiarity with one or more core technologies of Electronic Commerce. To business students with no technical background, Electronic Commerce is a technological black box. Given the rapid changes in information and telecommunications technology and the extent to which new technologies can prompt redefinition of business scope, each firm will require some means of tracking developments in its core technologies. Much of managers' demand for "awareness" activities concerns services designed to provide assistance in making business sense of technological trends.

In 1996 Kalakota and Whinston published *Frontiers of Electronic Commerce*, which is essentially a handbook for managers about the technological foundations of Electronic Commerce. While it covers some material on business models, economics, and cultural or social factors, it mainly describes the panorama of Electronic Commerce technologies "for business professionals – students, investors, executives, developers, managers, and other professionals – seeking an understanding of the fit between Electronic Commerce technology and business applications" (Kalakota and Whinston 1996: iv). The book is the best existing descriptive reference text for Electronic Commerce technologies. The technological domain of Electronic Commerce as described by Kalakota and Whinston is listed in Table 4: Electronic Commerce Technologies. More generally, Kalakota and Whinston identify eight network-enabled business practices that comprise today's Electronic Commerce: demand-driven manufacturing, virtual and team-based enterprises, logistics, desktop videoconferencing, document workflow systems, electronic mail, electronic data interchange, and technical data interchange (1997: 6).

Table 4: Electronic Commerce Technologies

Electronic Commerce Framework
The Network Infrastructure for Electronic Commerce
The Internet as a Network Infrastructure
The Business of Internet Commercialization
Network Security and Firewalls
Electronic Commerce and World Wide Web
Consumer-Oriented Electronic Commerce
Electronic Commerce Payment Systems
Interorganizational Commerce and EDI
EDI Implementation, MIME, and Value-Added Networks
Intraorganizational Electronic Commerce
The Corporate Digital Library
Advertising and Marketing on the Internet
Consumer Search and Resource Discovery
On-demand Education and Digital Copyrights
Software Agents
The Internet Protocol Suite
Multimedia and Digital Video
Broadband Telecommunications
Mobile and Wireless Computing Fundamentals
Structured Documents
Active/Compound Document Architecture

Source: Kalakota and Whinston (1996)

Statistics Canada, in its survey of the diffusion of technologies in service industries in Canada (Statistics Canada 1997), uses a more restrictive definition of Electronic Commerce than the OECD definition cited above. Statistics Canada distinguishes between office equipment technologies, telecommunications technologies, applications technologies, business processes, and a group of specific Electronic Commerce technologies, as set out in Table 5: Technology Diffusion in the Service Sector in Canada, 1996.

Table 5 shows how Electronic Commerce/office technologies are diffusing at various speeds. Excluding technologies such as standard telephones and fax

machines which are too ubiquitous to mention, the most widespread technologies are multipurpose, low cost ICT platforms such as personal computers and wireless communications technologies (67% and 57% of firms use them). Once this equipment is in place in a firm, then communications and information processing applications can be introduced. Applications of relatively easily automated administrative functions are becoming widespread. Computerized financial systems, inventory control, point of sale technologies, and order entry are reaching or exceeding the 50% penetration rate in firms. Internetworked communications media such as e-mail, Internet, and intranets are being used or considered for use by between a third and a half of all firms. However, the use of formal business process improvement techniques and methods, which require organizational change rather than just installation and implementation of hardware or software, is much less widespread among firms in the service sector.

Electronic Commerce is more than the sum of its parts. Electronic Commerce is essentially about doing business electronically, i.e. conducting transactions and maintaining relationships with customers and suppliers. Internetworking and intraorganizational integration, not simple efficiency, are the goals. The challenges of managing Electronic Commerce increase exponentially as the firm moves from isolated applications of this or that specific technology to applications that require cross-functional coordination, integration, management of the "extended enterprise" (i.e. relationships with customers, suppliers, and stakeholders), and ability to accurately make bets on rapidly emerging markets or technologies.

Table 5: Technology Diffusion in the Service Sector in Canada, 1996

(Statistics Canada, 1997)

Kind of technology	Specific technology	Use among service firms in Canada + implementing or gathering information
Office equipment technologies	Personal computers	67% + 6%
	Desktop publishing	23% + 10%
	External databases	15% + 14%
	Video conferencing	3% + 9%
Telecommunications technologies	Wireless communications	57% + 5%
	e-mail	28% + 19%
	Internet	19% + 22%
	E-mail to fax	14% + 21%
	Value-added networks	5% + 11%
Applications technologies	Computerized financial systems	60% + 10%
	Computerized inventory control	28% + 16%
	Point of sale terminal/debit card	35% + 6%
	Computerized order entry	27% + 11%
	Electronic funds transfer	2-% + 11%
	Electronic data interchange	14% + 12%
	Multimedia/computer-based training	7% + 12%
	Computer-aided software engineering	6% + 5%
Business processes	Total quality management	13% + 10%
	Business process reengineering	8% + 10%
	ISO 9000	2% + 9%
	Quick response production	6% + 3%
	Just in time	5% + 3%
Electronic Commerce technologies	Bar coding, imaging, optical character recognition, EDI, EDI to fax, electronic forms, e-mail, electronic payments, CD-ROM, electronic information services, optical cards, optical disks, smart cards	41% (use at least one)

Management and strategy implications of Electronic Commerce

Managing ICT-related innovation in firms

Nearly all observers of ICT-related innovation in firms, writing for students of management or for practicing managers and viewing it from a wide variety of angles, agree that vigorous assimilation and exploitation of ICTs are necessary actions for firms to succeed in the knowledge economy. Several recent examples of recent ICT-related management books are shown in Table 6: Managing in an Information- or Knowledge-Intensive Environment: Selected Recent Works.

In the aggregate, these and many other observers of the rapidly arriving Electronic Commerce revolution say that in the virtual economy, no tangible asset or market position can provide sustainable competitive advantage because the advantage will either become obsolete or be imitated. Most firms will have no other source of sustainable competitive advantage than their capacity to innovate, combining market knowledge and technological know-how to solve problems and create advantage. In order to create dynamic advantage, firms are advised to become "learning organizations" that continually improve themselves by upgrading their products, by improving their productivity and by building and maintaining their core competencies. Continual improvement is accomplished only if the firm is a successful learner, bringing in new knowledge from outside or creating it in-

Table 6: Managing in an Information- or Knowledge-Intensive Environment: Selected Recent Works

Thomas Davenport and Laurence Prusak, *Working Knowledge. How Organizations Manage What They Know* (1997).

Alistair Davidson, Harvey Gellman and Mary Chung, *Riding the Tiger* (1997)

John Hagel and Arthur Armstrong, *Net.Gain. Expanding Markets Through Virtual Communities* (1997).

T.G. Lewis, *The Friction Free Economy* (1997)

James Martin, *Cybercorp: the New Business Revolution* (1996)

Chuck Martin, *The Digital Estate. Strategies for Competing, Surviving, and Thriving in an Internetworked World* (1996)

Rolf Wigand, Arnold Picot and Ralf Reichwald, *Information, Organization and Management* (1997)

David Yoffie, ed., *Competing in the Age of Digital Convergence* (1997).

house. Since the ability to gain knowledge is the only sustainable competitive advantage that a firm can have, organizational learning must be considered the principal dynamic capability of a firm.

The magnitude of behavioral and organizational changes and adjustments that firms are called upon to implement in order to make the transition to knowledge intensive modes of production is frankly staggering. In terms of organizational format and culture, the prescription is that the traditional "top-down" management approach be eliminated in favor of a relatively decentralized team-based network from the functional areas of the firm. Low value-added, routine or commodity functions are to be outsourced. Through vigorous circulation of information within the firm, a shared vision and culture are to be established. New products and services are to be innovated with the close involvement of customers or suppliers. Multifunctional, multiskilled teams are to become the basis for the organization of work. They are responsible for managing end-to-end, horizontal business processes within the firm, implying ICT-enabled cross-functional integration where before “stovepipe” (vertical) administrative and information technology structures stood. Teams must be empowered to make decisions and be rewarded for outcomes rather than for task execution. Non-value-added activities must be identified and driven out of the firm.

The new network organization is destined to take the place of existing hierarchical or matrix companies. The core competency of a knowledge-based network firm is its ability to continuously generate and disseminate knowledge. This requires a degree of adaptability, flexibility, and imagination that is not apparent in many firms today. When established forces in corporations resist change in an attempt to retain influence and power, agile, entrepreneurial firms that understand and can react quickly to rapid market changes will have a chance to establish themselves.

This, in a nutshell, is the vision of the knowledge-intensive firm that is propagated in the current business management literature. Table 7 illustrates a version of this vision with a summary of key features of James Martin’s “cybercorp,” the ICT-enabled firm that knows how to take advantage of cyberspace and information superhighways.

Most observers regard the requirements of knowledge-based innovation as particularly stringent because innovation must be a continuous process, requiring that mobilization, restructuring, and change management be maintained for the foreseeable future. Most managers are aware of the gap between prescribed structure and behavior, and reality. The performance-prescription gap in knowledge-intensive firm management is paralleled by an older and abundantly documented performance deficit in the area of IT investments. For example, no correlation can be established between gross investments in information technology and firm profitability (Strassmann 1997). Similarly, reengineering initiatives have lost their luster, with a high rate of reported failures. A few dramatic cases of IT-enabled business transformation are being reported in the literature.[1]

Table 7: Some Characteristics of a "Cybercorp"

Uses ICTs as a corporate nervous system
Organizes business processes around value streams
Uses virtual facilities and relationships
Core competencies in different companies are networked to form virtual firms
Collections of corporations linked into cross-industry ecosystems
Spins off small new cybercorps
Designed for fast evolution and fast learning
Able to experiment throughout the firm
Able to choreograph complex operations
An exciting place to work
Melds technical and business cultures

Source: J. Martin, 1996

The degree of learning required to harness ICTs appears to put firms into a difficult situation. In addition to internal restructuring, the firm must restructure its relationships with customers, suppliers, and possibly other stakeholders who are part of the transaction network, optimizing operations that affect cost, quality, and cycle time. Researchers believe that active experimentation and improvisation over a period of time in a process of "unceasing recombination of resources" provides the most likely path of successful assimilation of new technologies and adaptation to unfamiliar organizational forms such as the "shapeless organization of the future" (Ciborra 1997: 257). Whether small or large firms are better recombiners of resources is unclear. Larger firms have the resources to make the sustained effort to move themselves down the learning curve. On the other hand, smaller firms, without the baggage of dysfunctional organizational routines, may learn more quickly, make mistakes less frequently, and experience fewer organizational constraints in the reallocation of resources.

[1] For example Marshall Industries, an electronics distribution company in the U.S. that was facing a classical case of disintermediation, reinvented itself as an "IT-shaped cybermediator" through vision, value innovation and rapid deployment of new technologies (Young, El Sawy, Malhotra, and Gasain, 1997). This paper won the 1997 SIM International Paper Awards Competition.

The structure and implications of Electronic Commerce within the firm: useful conceptual frameworks

Two useful conceptual frameworks are employed in Electronic Commerce classes at UNBSJ to explain kinds of IT and organizational innovation to business students. The Venkatraman (1994) model identifies five progressively larger domains of business transformation induced by application of information and telecommunication technologies. These domains represent not just increasingly large increments of IT application within the firm but also the steps by which IT business applications have emerged since the 1960s. Table 8 summarizes these transformations. The first two domains represent incremental technological and organizational changes; they are:

1. localized exploitation, in which an information technology application is business function-specific. Early IT applications were exclusively of this sort, automating routine office activities such as financial administration and aiming at cost reduction and increased efficiency.

2. internal integration, in which intra-firm “islands” of IT applications are linked, using a common IT platform as far as possible and permitting a degree of coordination and cooperation within the enterprise;

The three following transformations represent discontinuous changes for the firm:

3. business process reengineering, involving “thorough re-evaluation of the enterprise value-chain and the production process, and [relatively] far-reaching change” (Clarke 1994);

4. business network 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” (ibid. 1994);

5. business scope redefinition, involving migration of functions across the enterprise's boundaries, to the extent of changing the organization’s conception of the business it is in.” (Ibid.)

Table 8: IT-induced Business Transformations

(Venkatraman, 1994)

Level	Theme	Potential impacts	Major objectives	Management implications
One	Localized exploitation	Potentially high savings in narrow areas of business	Reduced cost/improved service	Identify firm-specific areas for exploitation
Two	Internal integration	Offers efficiency and effectiveness	Elevate IT as a strategic tool	Articulate the logic for integration
Three	BPR (workflow)	Powerful in creating differential capabilities in the marketplace	Reengineer the business with IT as lever	Aligning strategy with IT
Four	Business network reconfiguration	Opportunities for creatively exploiting capabilities	Create a virtual organization and occupy a central position in the network	Articulate the logic of network redesign for the focal firm
Five	Business scope redefinition	Alter business scope both proactively and reactively	Identify new business as well as potential threats	Identification of new scope of business

As the technologies of Electronic Commerce converge into pervasive networked interactive multimedia applications, its seems likely that internally motivated incremental transformations of business practice will become the exception. Externally induced internal integration, redesigned workflow, incorporation into business networks, and response to frequent threat or opportunity of redefined business scope will probably be part of the experience of most firms.

Bloch, Pigneur, and Segev (1996) have provided a useful business value framework for Electronic Commerce that includes ten value propositions (see Table 9). These propositions identify key ways in which Electronic Commerce creates value:

- Electronic Commerce permits the establishment of interactive relationships with customers, opening up possibilities for new ways of promoting products and creating a new sales channel for existing products.
- communication costs are reasonable because Electronic Commerce uses a public shared infrastructure.
- products, information, and services can be brought to the market much more rapidly than before.

- since Electronic Commerce systems are intelligent, they collect information about customers that can be useful in maintaining personalized relationships and providing enhanced support services.
- Electronic Commerce is becoming part of the image of a firm among a technologically literate segment of the population. Firms that are leading in Electronic Commerce are regarded as savvy and laggards are regard as firms that "don't get it."
- firms that are adaptable and rapid will have opportunities to experiment with new products, new services, new innovation processes, and new business models.

Table 9: Ten Value Propositions of Electronic Commerce

Proposition 1: Product promotion. Through a direct, information-rich and interactive contact with customers, Electronic Commerce can enhance the promotion of products.

Proposition 2: New sales channel. Thanks to their direct reach to customers and their bi- directional nature in communicating information, Electronic Commerce systems represent a new sales channel for existing products

Proposition 3: Direct savings. By using a public shared infrastructure such as the Internet and digitally transmitting and reusing information, Electronic Commerce systems can lower the cost of delivering information to customers.

Proposition 4: Time to market. Due to their instantaneous nature, Electronic Commerce systems allow a reduction of the cycle time associated with producing and delivering information and services.

Proposition 5: Customer service. Through intelligence built into systems and the extended availability of intelligent support systems, Electronic Commerce systems can enhance customer service

Proposition 6: Brand or corporate image. Electronic Commerce systems will become one of the components of a brand or corporate image, especially while targeting technology-friendly customer segment

Proposition 7: Technology learning and experimenting. Rapid progress in the area of Electronic Commerce will force companies to adapt quickly and offer them an opportunity to experiment with new products, services and processes

Proposition 8: Customer relationships. Electronic Commerce systems will allow for more personalized relationships between suppliers and their customers, due to their ability to collect information on customer needs and behavior patterns.

Proposition 9: New Product capabilities. The information-based nature of the Electronic Commerce processes allows for new products to be created or existing products to be customized in innovative way

Proposition 10: New Business Models. Changing industry structures and Electronic Commerce systems allow for new business models based on the wide availability of information and its direct distribution to end-customers.

Source: Bloch, Pigneur, and Segev (1996)

Many Canadian firms adopting various Electronic Commerce technologies and applications report positive benefits (see for example Statistics Canada, 1997). In fact, these reported benefits are so unambiguously positive, and the perceived barriers to adoption of Electronic Commerce technologies so straightforward, that it is hard to reconcile the apparent ease of adoption with the claims made by many management researchers regarding the complex challenges posed by implementation of Electronic Commerce technologies. How easily do firms of different types learn to use Electronic Commerce? This is a research question of some importance.

Electronic Commerce management education in universities

Formal management education in Electronic Commerce

In surveying programs and courses in Electronic Commerce, one needs to make a basic methodological decision about what to include. A broad definition of Electronic Commerce would encompass many courses and programs in Management Information Systems (MIS) and Management of Information Technology (MIT). Electronic Commerce, MIS, and MIT are three closely related and often overlapping areas of management training and enquiry. MIS is the oldest of these three areas and the one with the most clearly established boundaries and contents. It is moreover a recognized management discipline with certifiable skills and relatively clear career trajectories. Although the core of MIS is technical, the discipline includes a foundation of basic business administration skills as well as specialized skills largely having to do with understanding and managing information systems in organizations.

Management of Information Technology, in contrast, is a cross-disciplinary area of management education and enquiry with links into cognate social science and engineering disciplines having some interest in causes and consequences of innovation in ICTs. It arose as firms discovered that information technology was too important strategically to leave entirely in the hands of the technical managers. One of its principal constituencies is the group of persons with a technical background and several years of work experience who are moving from technical tasks to management responsibilities and who therefore need to acquire a more general management competency. Since they are frequently responsible for management of a technical function within a firm, these persons also frequently need to develop specific areas of competency having to do with understanding how the firm's technical functions are related to its other functions. A second, smaller, constituency of Management of Information Technology courses is composed of management students in the core business disciplines such as accounting, human resources, organizational behavior, or strategy who need to be conversant with information technology across the organization and to understand the economic and social implications of information and communications technologies. The "Techno MBAs" described later are examples of combined technical and business education.

Of the three areas of business education and enquiry having to do with managing ICTs in firms, Electronic Commerce is the youngest and the least well institutionalized. Historically, MIS focused on internal problems of information management in firms, while Electronic Commerce has had an outward orientation from its inception. Before the arrival of the World Wide Web in 1993-94, Electronic Commerce was a very highly specialized area of business expertise associated with the use of Electronic Data Interchange and Electronic Funds Transfer. With the arrival of Web-based commerce, Electronic Commerce as an area of business endeavour has captured a great deal of the imagination of younger people and business visionaries, and has spread quickly. The networking technologies that support Electronic Commerce among firms are also applicable internally, and so the historical outward orientation of Electronic Commerce and the internal orientation of information system and technology managers have become mainly conceptual legacies. However, among information system and technology management fields, Electronic Commerce has taken the lead in emphasizing the significance of new business models and their interrelationships within business networks.

Electronic Commerce has tended to establish itself in business and management schools first as a relatively general introductory course and then as a set of further courses that constitute an expanding ring of experiences providing a program or specialization within a business education. A growing set of new course materials has had to be invented for such topics as computer mediated communication, the demographics of the Internet, management of online businesses, marketing on the Internet, and Internet-related legal and policy issues. However, the more Electronic Commerce becomes an integrative concept within management thinking and practice, the more it draws into its ambit IT and IS management problems that might otherwise have found a home in an MIS department or in an MIT program. Examples are business process reengineering/workflow studies, systems analysis, strategy, purchasing, logistics, and organizational behavior related to network organizations.

If most relevant areas of education and enquiry coalesce to form an integrated Electronic Commerce curriculum, it might look like the curriculum for “Electronic Commerce/Management of Information Technology” described by Wang and Williams (1997). This curriculum includes eight components and several subcomponents, as shown in Table 10. Such a curriculum would provide a variety of technical and business skills.

We have taken the methodological decision to consider as “Electronic Commerce” only those programs or curricula that are called Electronic Commerce by their institutions. This is a restrictive definition that excludes most of the fourteen undergraduate and fifteen MBA programs that Wang and Williams (1997) count as offering a major or concentration in Electronic Commerce. Most of these institutions offer one or two courses called Electronic Commerce and a variety of electives from other streams having to do with information technology, but the program, major, or concentration is itself not recognized as “Electronic Commerce” by the institution.

Furthermore, we have restricted our analysis of Electronic Commerce management courses to ones for which the curriculum is available on line and which have the term Electronic Commerce in the title or are part of a designated and institutionally recognized concentration or major in Electronic Commerce. The rationale for this decision is as follows. The institutionalization of Electronic Commerce teaching and research capability within a university environment raises important questions about boundaries, professional recognition, control of curriculum, coherence of skill sets, and allocation of resources. Business faculties are among the most entrepreneurial and least tradition-bound of university faculties. However, it is easier to introduce a new course than a new program, and it is easier to relabel and redeploy existing courses within a new program framework than it is to develop a largely new curriculum and reallocate resources to provide for a specialized infrastructure. A certain institutional commitment to Electronic Commerce is required to maintain anything more than scattered Electronic Commerce courses across the range of programs and departments within a business faculty. If a university has a program or concentration that is recognized as “Electronic Commerce” then this signals that it has made a commitment to develop an Electronic Commerce stream, certify the quality of the people educated in this

Table 10: A Curriculum Structure for Electronic Commerce

- **Management Information Systems**
- Systems analysis and design
- Strategic roles of IT
- **Technical fundamentals of IT**
- Data communications
- System security
- Software development
- Database management
- “information highway” or web technologies
- **Accounting information systems**
- Electronic auditing
- Electronic banking
- **Business law**
- Legal issues
- **Organization Theory**
- Virtual organizations
- Networked organizations
- Organizational design
- **Marketing**
- Marketing in computer mediated environment
- **Policy**
- Strategy for Electronic Commerce
- Public policy for IT
- **General Management**
- Management of technology
- Business process redesign

Source: Wang and Williams (1997)

stream, and ensure the appropriateness of their skills in the job market.

Electronic Commerce is an emerging approach to business practice and so its present configuration is transitional. It must evolve quickly to keep up with changes in business practice and technology. At the same time, university-based Electronic Commerce education must fit into a structure of faculties, departments, disciplines, and subdisciplines, even when its subject matter cuts across many of these older accumulations of knowledge and skills and even if many of the streams of techniques and ideas that feed Electronic Commerce come from these earlier forms of organized business knowledge.

Therefore we investigate only university-based courses and programs that have been recognized as "Electronic Commerce" by their host institution.[2] We only include programs for which some information exists that can be accessed via the Internet. It is unlikely that any university offering training in Electronic Commerce is unable to mount an Internet presence, but some universities with online Electronic Commerce courses restrict access to them.

We have identified several kinds of Electronic Commerce programs, which are described below:

- General "business-centric" Electronic Commerce majors (UNBSJ)
- Business-oriented Electronic Commerce majors or concentrations taken in association with a certain amount of training in information systems (Monash, Deakin, Our Lady of the Lake University). These programs usually are associated with an MIS department.
- Electronic Commerce programs with a specialized focus within business. The focus is usually on marketing (Denver, Vanderbilt)
- Hybrid management/technical "Techno MBA" programs with "Electronic Commerce" in the title (University of Maryland)

Altogether, only seven universities are presently offering business education with recognized majors or concentrations that are explicitly called "Electronic

[2] In adopting this approach we recognize that the term "Electronic Commerce" does not necessarily mean the same thing in different languages. For example, it is far less frequently used in French than in English. Also, this approach underestimates the importance of IT management programs established in universities in the late 1980s or early 1990s which may provide Electronic Commerce-like education but which cannot call what they do Electronic Commerce, having already committed themselves to some other nomenclature and curriculum. Furthermore, two other terms are possible substitutes for "Electronic Commerce": these are "digital commerce" and "virtual commerce." They are not in widespread use and we do not investigate them here.

Commerce." However at least five dozen universities around the world are offering programs in which Electronic Commerce is a component (sometimes a key component). Courses on Electronic Commerce frequently appear within Management Information System programs. It is likely that many other Electronic Commerce courses and programs are germinating in universities, most likely in MIS departments. Also, many universities are offering "Techno MBA" programs combining business training with IT management and Information systems training. These programs frequently include one course on Electronic Commerce, which is usually an introductory course, and several other courses that easily would be considered to fall into the ambit of Electronic Commerce.

We have identified about fifty university courses in Electronic Commerce for which the syllabi are available on the Internet. These courses are described in a later section.

Between two and three dozen identifiable university-based Electronic Commerce research centres and groups of varying size and importance presently exist. Examples are the University of Texas at Austin, St. Gallen University in Switzerland, Cardiff University in Wales, the University of Minnesota, the University of California at Berkeley, and the CollECTeR research network, an international network based in Australia. These research entities contribute to the development and propagation of management skills in Electronic Commerce in diverse ways: through the production of reliable knowledge, hosting of conferences and electronic discussion fora, execution of contract research, editing and promotion of non academic or popular literature, facilitation of meetings, delivery of technical support services, and training of graduate students. An in-depth analysis of the world of economic commerce management research is outside the scope of this report. We have also identified an emerging stream of vocational training in Electronic Commerce at the junior college level. An example is Seneca College in Ontario. Analysis of such largely technical skill development initiatives in Electronic Commerce is also outside the scope of this report.

General Electronic Commerce business programs

In this section we describe four relatively general programs of education in Electronic Commerce: UNBSJ in Canada, Monash University and Deakin University in Australia, and Our Lady of the Lake University (OLLU) in the U.S. All are recently established programs in entrepreneurial universities. The UNBSJ and Monash programs are the most "business-centric" of the group, emphasizing

primarily non-technical business courses, while about half the courses in the Deakin and OLLU programs are technical.

University of New Brunswick, Saint John

At the University of New Brunswick, Saint John, the Electronic Commerce major is designed to

> train individuals to enter the world of online business; to become proficient in the use of the Internet (world wide web) and intranets (internal company management information systems); to conduct all facets of Electronic Commerce. As such, our students will learn how to create and market products and services for the Internet and to design and implement company-wide management information systems (UNBSJ 1997)

Students must complete at least 8 courses (24 credit hours), of which six are compulsory and two are elective. The compulsory courses are:

- Introduction to Electronic Commerce
- Marketing on the Internet
- Legal, Privacy, and Security Issues
- Management of Online Business
- Management Information Systems
- Special topics in Electronic Commerce (topics vary from semester to semester)

The electives are Organization and Electronic Commerce, Consumer Behavior, Accounting Information Systems, and Computer Applications to Business. Students with an undergraduate degree may return to the university for a certificate in Electronic Commerce by fulfilling the requirements for a major, including possible prerequisites. The first UNBSJ graduates with majors or certificates in Electronic Commerce will arrive on the job market in May 1998. UNBSJ also offers BBA majors in French, Accounting, Economics, Human Resource Management, and Hospitality Management.

The UNBSJ MBA program in Electronic Commerce, scheduled to begin in 1999, includes a similar set of courses which are offered during the third and fourth modules of the program, following the first two modules which are core courses shared with the international management stream.

The UNBSJ program has links with the Electronic Commerce Centre in Saint John, an alliance that includes the University, NB Tel, Sun Microsystems, DMR,

and Nortel, recently joined by the Government of New Brunswick and ScotiaBank.

Monash University

Monash University in Australia offers a model of general education in Electronic Commerce at all three levels – undergraduate, Masters, and doctoral, from the School of Business and Electronic Commerce in the Faculty of Business and Economics. The Monash curriculum is intended to cover the entire range of varieties of Electronic Commerce and a diverse set of electronic business situations, and relate them to the entire range of business disciplines. "Analysis of this impact [of Electronic Commerce], predicting its timing and direction, and the design and implementation of strategies for coping with the resultant change requires an understanding of change within the context of all the major business disciplines: management, marketing, law, finance, banking, and the economics of business overall" (MU 1998). Therefore, students accomplish what is in effect a double major, one in a traditional business discipline and another in Electronic Commerce.

Furthermore, Monash University is distinguished by its involvement in distance education. Classes are available on campus or by distance. Many classes are delivered in Asia, particularly Hong Kong and Singapore.

The twenty-four course, three-year undergraduate Electronic Commerce program is comprised of ten foundation business courses, eight electronic courses, and six courses in a traditional business discipline. The Electronic Commerce courses are:

- Introduction to Electronic Commerce
- Supra-organizational systems
- Commercial aspects of Electronic Commerce
- Electronic Commerce project management
- Information law
- Infrastructure for Electronic Commerce
- Electronic Commerce systems - analysis and design
- Programming for business applications

The last three mentioned are the more technical courses in the curriculum and are delivered by the computer science department.

Monash University also offers a two-semester Graduate Certificate in Electronic Commerce, a four-semester Graduate Diploma, and an Executive Certificate. The curriculum of the Graduate Diploma is the following set of courses:

- Introduction to Electronic Commerce
- Change management and Electronic Commerce
- Information exchange technologies and processes
- Applications in Electronic Commerce
- Information systems and technologies in Electronic Commerce
- Reengineering electronic business processes
- Technology management and organizational change
- Research project in Electronic Commerce

Upon completion of the course of study in Electronic Commerce the graduate is expected to have:

> a knowledge of the major technological elements and protocols underlying the strategies and requirements of Electronic Commerce; critical, analytical and technical skills in dealing with a range of Electronic Commerce applications; the ability to communicate the concepts and processes of Electronic Commerce clearly and effectively within their organizations; an understanding of the importance of change management and its application in a variety of practical contexts; and independent learning and research skills in the Electronic Commerce environment (MU 1998).

Like other Australian universities, Monash has a number of consulting arms, including an Electronic Commerce Centre with an associated consulting staff that offers for-fee research, training, and consulting services in several areas of the country.

Deakin University

The Deakin University experience in designing and delivering business education in Electronic Commerce is described by Braithewaite, Fountain and Joyce (1997). The undergraduate Electronic Commerce program was introduced in 1997, with a graduate program to commence in 1998. The Electronic Commerce major is within the Management Information Systems specialization within the School of Management Information Systems. This specialization builds on Deakin's prior experience in Electronic Data Interchange, which was brought into

the curriculum in the mid-1980s. The Electronic Commerce curriculum is designed to complement an MIS course of study: specifically,

> the MIS major has an internal focus in that it is directed towards the analysis, design and implementation of business systems, to provide information for management. The Electronic Commerce major has an external focus, in that it looks at communication of data, and the sharing of information between companies and clients (Braithewaite, Fountain and Joyce, 1997).

To complete an undergraduate major in Electronic Commerce, students must take a total of six courses: one in Business Information Systems, two from among Systems Implementation, Information Systems Networks, Introduction to Business on the Internet, or Electronic Communication and Information Sources, and two from among Advanced Internet Applications, Electronic Commerce, Information Systems Project, or Electronic Document Design.

The training in Electronic Commerce is designed to provide skills that will enable students to:

- create multimedia Web documents
- establish a commercial WWW presence
- manage commercial Internet facilities
- conduct commerce over the Internet
- conduct Electronic Data Interchange
- manage computer facilitated communication and workgroup computing
- manage corporate intranet facilities
- develop corporate networking and communication strategies
- maintain security of data (Braithewaite, Fountain, and Joyce, 1997)

Students can complete a double major in Electronic Commerce and MIS. The latter major qualifies them for admission at the Professional level into the Australian Computer Society.

According to Braithewaite, Fountain, and Joyce, the new Electronic Commerce major has helped to increase the popularity of MIS and other computer-oriented subjects at the expense of Law, Accounting, and Economics. Moreover, the Electronic Commerce program has reportedly become popular among students in Marketing, who are tending to pursue a double major in Marketing and Electronic Commerce.

Deakin has launched an innovative experiential teaching initiative called the Lighthouse Project to allow students to engage in simulated Electronic Commerce. The Lighthouse Project is a test bed that

> will involve a selection of sites from industry, government, and academia that will be chosen to give a representative cross-section of the Electronic Commerce community to highlight basic issues including the approaches and styles used by Electronic Commerce sites, the points and concepts raised by each implementation, and the mechanisms used by each site (e.g. Java, ActiveX, VRML, etc.)

The sites will be brought together into a Deakin Electronic Trading Community focusing on the textile, clothing and footwear, banking and finance, educational, and regulatory sectors.

Our Lady of the Lake University

Our Lady of the Lake University, a private, Catholic university in San Antonio, Texas with satellite campuses in other Texas cities, began to offer business education in Electronic Commerce in 1995 or 1996. OLLU offers Bachelor of Science and Bachelor of Business Administration degrees in Electronic Commerce (OLLU 1998). The Bachelor of Business Administration degree contains 39 hours of business courses (13 courses), 15 hours (5 courses) of computer information systems courses, and 18 hours or 6 Electronic Commerce courses:

- Introduction to Electronic Commerce
- Telecommunications Management
- Telecommunications Technology
- Computer and Telecommunications Security
- Electronic Commerce Systems Project
- Advanced Electronic Commerce Elective

Our Lady of the Lake University became involved in Electronic Commerce through its work with the CALS Shared Resource Center in San Antonio. CALS (Continuous Acquisition and Life Cycle Support) is an approach originally designed to move government agencies from intensive use of paper to highly automated and integrated modes of operation. Following a 1994 US Presidential memorandum stipulating use of Electronic Commerce in all federal agencies by January 1997, the CALS center was renamed the Electronic Commerce Resource Center (ECRC, of which there are presently sixteen in the United

States). OLLU proposed becoming the lead educational institution for the San Antonio ECRC. In October 1995 OLLU received a grant from the U.S. Department of Education in support of a degree in Electronic Commerce and the development of an Electronic Commerce laboratory and an Electronic Commerce Technical Centre. The OLLU Electronic Commerce program should have been fully operational by the beginning of 1997-1998, but little information about it currently is available.

Specialization in Electronic Commerce and Marketing

Some Electronic Commerce programs or majors focus on one or another aspect of Electronic Commerce to create a specialization within the broader area of Electronic Commerce. In the two cases we have identified, the specialization is in the area of marketing.

Electronic Commerce Marketing: Daniels College of Business, University of Denver

The Daniels College of Business at the University of Denver (UD 1997) offers an MBA in Electronic Commerce with specialization in marketing. The MBA consists of a core curriculum of eleven courses and an Electronic Commerce marketing specialization of five courses:

- Electronic Commerce
- Systems Analysis and Design
- Data Base Management Systems
- Marketing Research and Information Management
- Marketing in an EC Environment

Possible substitutions and electives include Networks and Telecommunications, Competitive Uses of Information Technology, and personal productivity uses of information technology (use of word processing, spreadsheets, the Internet, etc.). Thus the University of Denver MBA in Electronic Commerce is composed of a core MBA curriculum, one general Electronic Commerce course, two relatively technical IT systems courses, and two marketing courses.

The University of Denver's Electronic Commerce program is housed in the new Department of Information Technology and Electronic Commerce (ITEC). ITEC is the former Management Information Systems department renamed because "the terms 'information technology' and 'Electronic Commerce' more adequately describe the types of careers that our graduates will be pursuing" (The Source

1997). The MIS program produced graduates who typically pursued IT consulting careers, often with larger consulting firms. The growing Electronic Commerce practices of these firms prompted the migration from MIS to Electronic Commerce at the University of Denver. The MBA in Electronic Commerce is specifically designed to prepare students for careers in strategic marketing in an EC environment. ITEC also offers a Master's in Information Management (MIM). The Marketing MBA is less technical than the Electronic Commerce MBA, which in turn is less technical than the MIM.

Electronic Commerce Marketing: Owen School of Business, Vanderbilt University

Vanderbilt University's Owen School of Business also offers MBA education in Electronic Commerce with a focus on Marketing. The Electronic Commerce Emphasis at Vanderbilt is strongly oriented toward marketing in computer-mediated environments. It grew out of Project 2000, the Research Program on Marketing in Computer-Mediated Environments, and was established in 1994 by professors Hoffman and Novak to study the marketing implications of commercializing the World Wide Web. Owen's Electronic Commerce Emphasis was established in January 1996 in response to the student demand for formal training in Electronic Commerce. A second specialization, the Telecommunications and Electronic Commerce Concentration, was launched in January 1997 to provide greater access to IT and MIS skills. MBAs with concentrations in Electronic Commerce were first graduated in 1995.

Like the Daniels curriculum, at Owens Electronic Commerce is an "emphasis" of four courses (eight hours) which may be added to any "concentration," or major. One of the courses must be an Electronic Commerce course within the concentration. If no Electronic Commerce course is offered by a particular major (for example, finance), a student may take an independent study course on Electronic Commerce aspects of the major. The Electronic Commerce emphasis is "open to all concentrations and can be tailored to a student's unique set of skills, interests, and career goals."

The Electronic Commerce emphasis is comprised of three groups of courses, plus electives in an area of concentration: one foundation course, one macro issues course, and one micro issues courses, as below:

- Foundation course: Marketing in Computer-Mediated Environments
- Macro issues
    - Marketing in Computer-Mediated Environments Projects
    - Management of Technology

- Telecommunications for Competitive Advantage
- Electronic Commerce & the Virtual Organization
- Internet & the Information Superhighway
- Strategy for Electronic Commerce

- Micro Issues
  - Decision Support Systems
  - Introduction to Data Base Management Systems
  - Telecommunication Management
  - Wireless Communication

Courses deemed Electronic Commerce electives include International Operations; Environmental Issues in Marketing; Operations, Planning, and Control; Cost Accounting; Seminar in Management Information Systems; Special Topics in Management Information Systems; Research Seminar in Marketing; Independent Study in Economics; Independent Study in Marketing; and Independent Study in Management Information System.

The technical component of the MBA comes from the Micro Issues course and any electives related to the area of concentration. However, students are expected to acquire competence in the use of computers and may be authorized to take an upper level computer science or engineering course for credit as an elective for the MBA degree.

Techno MBAs and Electronic Commerce

"Techno MBAs" are hybrid programs of study that combine graduate business education with a technical concentration in Information Systems or Information Technology Management. People trained in a Techno MBA program are expected to

> bridge the gap in the corporate world between management/business units and the IT department. In other words, they are expected to achieve enterprise integration through technology. Many companies have paid big bucks to bring in the 'techies' and the hardware. Now they need the managers that know how to make IT work for the benefit of the company. More than 300 colleges and universities in the USA have developed Techno MBA programs to produce this next generation of managers (MBA Plaza Editorial, 1998).

Techno MBAs are trained on the same hardware and software they find in the business world. The best programs "offer the strongest mix of business, technical, analytical, team and communications skills and relevant work experience" (Maglitta 1997). The holders of techno MBA degrees are usually hired as systems integrators by consulting companies. One Big Six consulting firm hired 450 MBAs in a recent year.

The three hundred business programs offering "Techno MBA" concentrations produce only about 3000 Techno MBAs per year, far below the roaring demand for managers with IT and business skills. The starting salaries of Techno MBAs are said to be 30% higher than those of ordinary MBAs, with a 1997 average of US$ 54,000. Computer World publishes an annual ranking of the top twenty-five Techno MBA programs in the United States. The top schools are the ones with strong business programs and IS programs: MIT, University of Texas, Carnegie Mellon, Minnesota, etc. Top business schools without an Information Sciences concentration (Harvard, Duke) are not in the Techno MBA game. Strong Techno MBA programs have high spending rates on information technology, have good corporate contacts, a strong IS program, and other characteristics (see Table 11: Characteristics of Strong Techno MBA Programs).

Table 11: Characteristics of Strong Techno MBA Programs

According to Maglitta (1997):

"A strong IS program. It's axiomatic, but the best Techno MBA schools also boast strong undergraduate and graduate IS departments. They include the University of Minnesota, Georgia State and New York University. Carnegie Mellon adds more exotic specialties such as artificial intelligence and expert systems to its curriculum.

Heavy use of technology. Top Techno MBA programs practice what they teach. They spend more than the $700-per-student average for business schools. The University of California at Irvine is the leader and spends $2,571 per student. MIT, Carnegie Mellon and the University of Texas at Austin boast state-of-the-art securities trading floors. The University of Michigan offers a 900-node Ethernet network. World Wide Web classes and business simulations let Carnegie Mellon students interact with fellow students in Japan and Sweden. Among other innovations, MIT uses virtual reality to view market research data. "We walk the talk," says Dean Glen Urban.

Strong ties to industry. MIT has signed two dozen corporate megasponsors for its "Inventing the Organizations of the 21st Century" partnership. The chairmen of Xerox Corp. and American Management Systems sit on the board at Carnegie Mellon. Get the picture?

An integrated curriculum. No good Techno MBA program is an island. The best programs offer cross-training in courses that include faculty from finance, economics, accounting, engineering and other departments.

Good public relations. A strong marketing and public relations effort never hurt any MBA program. To be well-known is to be well-ranked, especially among recruiters. As a result, it's tough for excellent smaller or regional schools such as Babson College in Babson Park, Mass.; Bentley College in Waltham, Mass.; and the Stevens Institute of Technology in Hoboken, N.J., to crack national lists."

Demand for places in Techno MBA programs is high, and some schools are expanding rapidly to meet it. In two years, enrollment in the University of Texas' information management program increased from thirty students to more than

two hundred, representing about forty percent of the business school's enrolment (Maglitta 1997). Enrolment in MIT's Sloan School rose more than thirty percent to nearly seven hundred students in a recent year.

The demand for Techno MBAs is coming largely from end-user departments or business units rather than from IS departments. The rule of thumb is that Techno MBA degrees are appropriate as management duties and end-user contact increases. Techno MBA degrees appeal most to IS workers between 25 and 30 years of age who can afford two years of full-time study and who aspire to move into management positions. The prospect of earning $30,000 more than former colleagues is also attractive.

Virtually all Techno MBAs identify themselves as an MBA with an IS or IT concentration. We found only one that uses the term “Electronic Commerce” in its title. It was just launched by the University of Maryland Business School’s Department of Management Science and Statistics in the area of Telecommunications and Electronic Commerce. The curriculum includes courses on Telecommunications and Computer Networks, Management of Telecommunications Networks, Telecommunications Economics and Policy, Data Mining and Data Warehousing, Electronic Commerce Design of Telecommunications Solutions for Business Problems, and Local Area Network Architectures and Management.

Clearly Techno MBAs, rather than programs called Electronic Commerce, are business schools’ response to industry demands for IT-savvy middle managers in business units, user departments, or consulting firms. The domain of business and technical expertise covered by Techno MBAs is not so different from that covered by the IS-oriented Electronic Commerce programs discussed earlier. The main difference is in the relatively greater emphasis that Techno MBA programs give to intra-firm technical problems compared to the Electronic Commerce programs’ greater attention on inter-firm linkages and the external environment of firms.

In summary, Techno MBAs are not, strictly speaking, degrees in Electronic Commerce. However Techno MBA programs are in a good position to follow demand into Electronic Commerce as it develops. The lucrative market for Techno MBA degrees obviously militates against a name change. Nevertheless it would not be surprising to see some Techno MBA programs begin to differentiate themselves from the others by calling themselves Electronic Commerce Techno MBAs programs.

Historically, the preparation of people to manage in technology-intensive environments has proceeded in three steps. In the first step, people with technical backgrounds were given management responsibilities on the basis of

their on-the-job experience and aptitudes. In the second step, people with technical backgrounds and on-the-job experience are being given formal business management training, usually at the MBA level. The Techno MBAs are a good example.

In the third step, people with business backgrounds are given supplementary technical training or special business education designed to make them conversant with technological problems and procedures. This represents the opening of a new kind of career path for people without narrow and deep technological skills, a career path designed to bring business skills into contact with technological environments to provide the kind of flexibility and business creativity that senior managers are now saying is needed. Most Electronic Commerce programs take this approach.

Electronic Commerce course syllabi

When the World Wide Web emerged in 1993-94, those in universities who most quickly recognized its business significance tended to be found among MIS researchers and educators, many of whom had prior experience in business implications of information technology. In 1995 there were approximately 2,000 MIS faculty members in the U.S. and Canada, and about 5,000 worldwide, as reflected in the ISWorld Net Faculty Directory. The ISWorld Net, which serves this community, is an extensive collection of teaching and research resources and services. The Teaching and Learning section contains a large subsection on Electronic Commerce which has several useful features including a collection of cases, a hyperlinked list of Electronic Commerce course syllabi, and a discussion list on Electronic Commerce courses called ECOMMCOURSE.[3] It is useful to quickly examine the evolution of this feature because it provides insights into the changing sense, among MIS educators, of the skills needed for Electronic Commerce among business and MIS students.

- The section on “Knowledge Structure” contains subsections on Skills, Issues, Applications/Concepts, and Industry, each of which contains individual segments maintained by individuals on a volunteer basis. The material collected here is uneven and frequently out-of-date, but the organization of the “Knowledge Structure” usefully describes a formulation of the knowledge and skills elements of Electronic Commerce and the relationships among them. For this reason we have reproduced the classification tree in Appendix 1: Electronic Commerce Knowledge Structure. The “knowledge structure” contains four principal components: Technology and Skills, Issues, Applications and Concepts, and Industries. Of these the first is the best

[3] http://www.isworld.org/isworld/ecourse/isw34111.html

developed, and the last two the least well developed in terms of content provided by volunteer editors.

- Mondex Global Lesson, conducted in October 1997, was an online case examined by virtual groups of students. The groups filled up very quickly.
- The list of course syllabi presently contains 28 Electronic Commerce syllabi, six from the 1997-98 academic year. We examine these syllabi in greater detail below.
- The discussion list ECOMMCOURSE, created in May 1995, has 385 subscribers in March 1998. However this list has generated no traffic since August 1997.
- The case section contains nine on-line cases, two of them quite new. The older cases date from 1994-1995 and have lost some of their original utility.
- The video and software sections are still empty, signifying that the community of Electronic Commerce educators does not rely on video-based instruction or on simulation exercises.
- The article section contains hyperlinked references to scholarly literature on Electronic Commerce, most of it dating from the period 1994-1996.
- The design station section contains information PC and Macintosh web design software tools. This section is very much out of date.

Overall, the ISWorld Net Electronic Commerce site contains useful research and teaching materials. However the site has not become the encyclopedic resource it was originally designed to become. The field of Electronic Commerce has expanded far too rapidly to be comprehensively tracked by a collection of volunteer editors. Material is so abundant, becomes dated so quickly, and the notion of Electronic Commerce inclusive enough that it is an extremely challenging task to attempt to maintain a current Electronic Commerce alpha site (prime gateway) on the World Wide Web. Thus a project begun in 1995 showed signs of exhaustion by late 1996 as the Big Bang of Web-based Electronic Commerce far outpaced the ability of the MIS educator and researcher community to catalogue and categorize it. In particular, the arrival of many competing gateway sites, information resources, and publications in the field of Electronic Commerce makes the job of cataloguing and guiding an increasingly difficult one. The quick inflow of non-academic actors into Internet affairs with the arrival of the Web in 1993-1994 led to an exponential increase in material, with consequent deepening of the subject matter. This has upped the ante considerably for would-be information gatekeepers. Furthermore, the role of cataloguing and guiding via a web site has been picked up as an influence strategy by online publications and other specialized information brokers with greater resources to invest.

Appendix 2 provides information on nearly 50 university-based Electronic Commerce courses for which syllabi are available on the WWW. About sixty percent of these courses are on the ISWorld Net Syllabi page, which is the single best source of information on Electronic Commerce course syllabi. The others we have identified through Internet searching. To be included on this list a course had to fulfill one of three conditions: i) presence on the ISWorld Net list, ii) identifiable as an Electronic Commerce course through the term Electronic Commerce in its title and indexed in the World Wide Web; or iii) figuring in a designated Electronic Commerce program, major, or concentration with syllabi on the Web. Therefore, missing from the list are courses on Managing Information Technology that may cover Electronic Commerce topics; courses offered outside of business schools that aim to develop Website design and management skills in students, and courses from specialized areas of IT management that are converging with electronic commerce, such as Business Process Engineering (we examine BPR in a later section).

Characteristics of Electronic Commerce courses in universities

The first characteristic of these courses that bears mention is their currency. The average age of the nearly 50 courses on our list is less than nine months and the median age is six months. Eighteen (more than one third of the courses) are being offered in the current university term (Winter/Spring 1998). Ten were offered in the fall of 1997, nine were offered one year ago in Winter/Spring 1997, and nine are older than one year. Although the ISWorld Net course syllabi page is the single best source of information on Electronic Commerce courses, it gives the impression that the courses are relatively evenly distributed in time. In fact their instructors have updated many of the earlier courses, and the references on the ISWorld Net page are to the recent versions. Courses in Electronic Commerce have to be updated every time they are given. The field is moving so quickly that substantive course materials have a very short shelf life.

At the same time, the technical skills of business students are evolving. This has had consequences for the design and content of Electronic Commerce courses. The technological learning curve evidenced by these courses is the second characteristic to mention. Early Electronic Commerce courses necessarily had to provide instruction in use of Web technologies. In fact a major subsidiary aim of these courses was to make business students Web-literate. Thus the courses frequently emphasized acquisition of simple HTML skills, preparation of home pages, Internet searching skills, and Internet purchasing skills. These skills were much more novel in 1995 than they are in 1998, and most universities now routinely offer technical or remedial courses in web skills to students, relieving Electronic Commerce courses from the task of diffusing web skills. Thus some

Electronic Commerce courses such as McCann's *Marketing and the Internet* course at Duke University, which when offered in 1995 and 1996 had included web page construction as part of the objectives of the course, had dropped this objective by 1997. Students were expected to possess basic Internet skills, including navigation and simple web site construction capability.

The limited variety of textbooks in introductory Electronic Commerce courses is the third characteristic of these course syllabi. The older Electronic Commerce course syllabi show that the first generation of courses dates from the academic year 1994-95. The first textbook used was Mary Cronin's *Doing Business on the Internet* (1994). However, before 1996 there was no standard textbook, and courses used a variety of books and on-line materials. By 1996 Kalakota and Whinston's book began to appear in courses. Their *Frontiers of Electronic Commerce* has already been mentioned. It is a comprehensive reference manual that covers a broad range of Electronic Commerce issues, managerial as well as technical and organizational. In the spring of 1997 Kalakota and Whinston's *Electronic Commerce: a Manager's Guide* appeared and quickly became the standard textbook for introductory or general Electronic Commerce courses at the graduate and undergraduate level. This book is almost as comprehensive as the earlier book, but is condensed and is organized by more abstract themes than the earlier one which mixes chapters focusing on technological problems with others that focus on organizational or managerial issues. Two recent books are contenders for the Electronic Commerce textbook market: Kosiur's *Understanding Electronic Commerce* (1997) and Whinston, Stahl, and Choi's *The Economics of Electronic Commerce* (1997). These have started to appear in the syllabi. Kosiur's book is a practice-oriented book aimed at business learners rather than technical managers; it includes a number of case studies. At UNBSJ, it is presently being used as a textbook in an Introduction to Electronic Commerce class where it is being received by undergraduate students with greater favor than *Electronic Commerce: a Manager's Guide*. The Whinston, Stahl and Choi book is pitched at the "accomplished-expert" level of users. It is the first textbook to examine the economic foundations of Electronic Commerce and it will appeal to business schools that begin to offer courses in this subject. If any such courses are currently being offered, their syllabi are not available online and their presence is not being signaled.

In summary, most Electronic Commerce courses make abundant use of on-line resources. Some use a combination of online resources and paper handouts, while some make exclusive use of online resources. The wide availability of online material and the rapid evolution of the Electronic Commerce business world represent major competition for textbooks in this area of education.

A fourth characteristic of many Web-based Electronic Commerce courses is their reflexivity: they apply the principles of good Electronic Commerce practice to themselves and they try to practice what they preach. They use the Web as a service delivery channel, they provide a degree of customization, according to the interests of the students, they aim at rapid turnaround time and efficient response, and they support teamwork and collaborative knowledge production through the use of information technologies. Since many of the Electronic Commerce courses originate in IS departments, instructors posses a greater degree of technological literacy than the average university educator. They make ample use of electronic conferencing, university-sponsored websites, and, increasingly, intranets as teaching support systems. Some of the courses are framed as “knowledge collaboratories”, designed to produce very current business knowledge via Web research, package it, and share it among course participants. Although some instructors leave their course syllabi and student projects on publicly accessible websites, others are placing course materials on intranets along with conferencing functions and briefing materials contributed by guest speakers from industry. The latter trend is leading to the retirement of some courses from public view as access to lecture notes and course syllabi is restricted to registered students with passwords.

Conspicuous by its absence is a discussion about the kind of technical infrastructure required to train students in Electronic Commerce. The technical component of Electronic Commerce lies mainly in programming and systems analysis, for which existing computer labs are used. The business component covers business models and cross functional knowledge, as well as cognate knowledge from traditional business disciplines in the cases in which Electronic Commerce is taught as a double major or as an emphasis or concentration accompanying a major in a traditional area. One would expect to see greater discussion of interactive simulations or pilot installations to be used for training students. The only identifiable project to create a simulated Electronic Commerce environment is Deakin University’s projected Electronic Trading Community.

Electronic Commerce management learning environments in the private and public sectors

In this report, we have focused primarily on management training in Electronic Commerce in universities. However, universities have no monopoly on the provision of management learning experiences. The explosion in Electronic Commerce has given rise to a plethora of learning activities delivered by consulting firms, public technical assistance agencies, and industry associations. Many of these activities are formal services aiming to promote management learning, and many others aim to improve the “awareness” of managers regarding Electronic Commerce or some segment of it.

In several respects, management training providers outside the university sector enjoy advantages that universities do not enjoy. Management training offered under the auspices of industry associations offers the advantage of proximity to business and recognition of competence by the industry sponsors. Management training offered under the auspices of public agencies frequently enjoys access to significant resources and advanced technological infrastructure unmatched by many institutions of higher education. Furthermore, public technical support agencies for Electronic Commerce, especially when they are funded under a defense umbrella as is the case in the United States, are not obliged to recover costs and so can offer a variety of services for free.

Finally, management training offered under the auspices of consulting companies has the advantage of speed and currency. The larger consulting companies not only have a very extensive knowledge base concerning management practice, due to their on-site observations in a wide range of firms, but they also are pioneers in the use of information and communication technologies to manage and deploy the corporate knowledge base. In this respect they are far ahead of most universities, which despite their many virtues may experience difficulty practicing what their management faculties preach in terms of organizational change and customer service. Higher education is a service industry that will be deeply affected by Electronic Commerce. Many institutions seeking to brand their educational services are actively exploring distance education delivery channels. There is, furthermore, a steady trend to establish internal corporate training facilities and even universities, some of which have sought and obtained

degree-granting status. It is outside the scope of this report to examine the implications of the use of Electronic Commerce technologies in the delivery of educational services, but we must recognize that the impact could be dramatic.

Electronic Commerce management skills development outside the university: three configurations

The supply of management learning opportunities in Electronic Commerce and its components outside the university sphere is so great and so varied that one scarcely knows where to begin a description of these activities. It is not feasible to quickly assess the quality or the availability of this aspect of Electronic Commerce because of its variety and complexity. Electronic Commerce is affecting every industry, but not at the same speed and certainly not with geographical uniformity. Therefore management learning opportunities are generally most available in industries that are actively making the transition to Electronic Commerce, in regions in which such industries are concentrated, and in professions or branches of Electronic Commerce which already have a decade or more of experience and so are relatively well structured. Examples of such relatively well-structured professions can be found in purchasing and logistics management. Professionals in these areas are currently expected to make the transition to new modes of management of electronic transactions, and so their professional associations offer management training and skill certification schemes. EDI is an example of a relatively well-structured branch of Electronic Commerce that has certification procedures and clear skill requirements that are related to mastery of particular EDI technologies.

For purposes of illustration we have selected three examples of Electronic Commerce management training from outside the university sphere. We have selected these examples because they represent kinds of Electronic Commerce issues that are likely to be germane to Canada. The first issue is: how to help Small and Medium Firms (SMEs) make the transition to Electronic Commerce? The second issue is: how do professionals upgrade their skills in a business function that is rapidly transitioning to Electronic Commerce? The third is: how to help businesses redesign their internal workflows and business processes to take advantage of Electronic Commerce?

SMEs and Electronic Commerce

It seems likely that Electronic Commerce will open up many growth and development opportunities for agile firms, even very small ones. However the threat is at least as great: because Electronic Commerce represents a very fast-moving package of technologies and management skills, the opportunities may be quickly captured by the most agile firms while the laggards find themselves at a serious disadvantage.

The first wave of Electronic Commerce was based on EDI technologies. It was induced more often than not by the supply chain management activities of small firms' larger trading partners or by industry-wide supply chain reengineering initiatives. As mentioned earlier, EDI did not diffuse as widely as anticipated because of the costs, the relative rigidity of the technology, and the difficulties in linking external automation with internal automation. Parker and Swatman (1997), in a review of twenty-two research studies on EDI diffusion among small firms, identified twenty-six different barriers discouraging the adoption of EDI by these firms, including factors of cost, technological complexity, and sense of strategic significance.

The present e-commerce situation is very different because the Electronic Commerce technology package is much more adaptable and user-friendly than before. This package is applicable to many business situations and potentially applicable to many more, and it is evolving very rapidly. Electronic Commerce is hardly the nostrum suggested in some of the more enthusiastic trade literature. However, many of the skeptical discussions in the business press about "who is making money on the Net" overlook the qualitative advantages that come from learning how to use the new Electronic Commerce media. It is not unusual for firms to generate only a small fraction of their income from web-based activities. For example, the used-record business is currently based on the use of paper catalogues, voice phone calls and faxes. However, a number of firms are betting that the business will increasingly rely on electronic markets because of the efficiencies and advantages that these would offer to suppliers and customers alike. Firms that are presently experimenting with web presences will be in a much better position to pursue openings in Electronic Commerce as staff and customers learn how to use it. Many firms exploit only a small fraction of the potential of web-based Electronic Commerce because this amount of use of the new medium offers the right balance of risk and rewards to them. Although a firm's web site may not be used for transaction processing, it may well generate indirect business since customers presently use web searches to obtain information for use in purchasing decisions. Use of the World Wide Web for communication, rather than transaction processing, is the first step taken by

many small firms into the world of Electronic Commerce (Poon and Strom 1997; Poon and Swatman 1997).

Second, the degree to which serious implementation of new technology must be accompanied by organizational innovation is often underestimated by management. This is probably the case when Canadian service firms report that cost, not complexity, is the primary obstacle to the implementation of various discrete Electronic Commerce technologies (as reported in Statistics Canada 1997). Firms learn from customers and suppliers. Firms that are members of coordinated chains are able to make more productive use of new technologies than isolated firms are. In the case of the introduction of Efficient Customer Response (ECR) systems among grocery stores in the U.S., for example, members of chains were able to coordinate organizational and marketing decisions regarding pricing, promotion, shelf space, and product assortment. Among isolated firms, only "visionary, energetic owner/managers" were able to seize opportunities presented by ECR systems (Phumpiu and King, 1997).

Third, although a simple web page can be established at very low cost, this is a very minor foray into Electronic Commerce. A complex and current web site can cost upwards of $100,000; a Fortune 500 e-commerce site costs around $1M. An integrated enterprise server goes for over $150,000 and set-up cost are almost the same, while annual service charges can run to $60,000 or $70,000 (Kerstettner 1998). To fully implement an Electronic Commerce system in a medium-size firm implies that the firm and its vendors are put on-line, using common interfaces, standardized catalogs, and common applications for invoicing and ordering, at an estimated cost of about $6 million (Sollish 1998).

The question of diffusion of Electronic Commerce capabilities to SMEs is rising on the policy agenda, and many different initiatives are presently underway to provide information, technical support, and awareness to the SME sector. The Australian Electronic Business Centre recently identified 64 Electronic Commerce centres in the world, of which 30 are supported by governments, 16 by industry associations, 10 are in universities, and 8 are maintained by for-profit organizations (AEBD 1998).[4]

These centres offer among their research, technical assistance, policy, technology demonstration, and information dissemination services (Myer 1997). Several also offer educational and training services aiming to improve the capacity of SMEs to manage Electronic Commerce. As an example, the Electronic Commerce Innovation Centre in Cardiff University in Wales offers customized short courses on EDI and Electronic Commerce. The sixteen

[4] The sixteen Electronic Commerce Resource Centers (ECRCs) in the U.S. were counted as one institution in the AEBD study.

Electronic Commerce Resource Centers (ECRCs) in the U.S. are operated by local universities or private contractors on behalf of the U.S. Defense Logistics Agency and the Department of Defense. These centres offer an extensive portfolio of Electronic Commerce services to U.S. firms, including free technical and management training. The free courses and seminars recently offered by the ECRC in Palestine, Texas are shown in Table 12. The courses are delivered by the Palestine ECRC at the Electronic Commerce Education and Training Centre, a 5,000 square foot facility operated in association with a local community college. The facility contains a wide-area network, a local area network, computing facilities, conferencing facilities, and computer-based training facilities in EDI, desktop publishing, and other disciplines. At any given time about 250 such courses are available across the United States through the ECRC network.

Table 12: Management and Technical Seminars and Courses Offered by U.S. Electronic Commerce Resource Centers

Electronic Commerce Hardware and Software Requirements
Getting Started in Electronic Commerce
EC for Government Acquisition Personnel
The Internet as a Business Platform
Internet Business Marketing
Internet Business Operations
Internet Security
Introduction to EDI
Business Opportunities with the DoD through EDI
Issues in EDI Implementation
EDI Software Characteristics
Introduction to EDI Mapping
Financial EDI and EFT
Technical Data Interchange
Recovering Design Data
CALS and Integrated Manufacturing
Legacy Data Management
Standard Generalized Markup Language
Business Needs Analysis
Data in a Business Environment
Concurrent Engineering
Geographic Information Systems

In summary, the question of diffusion of Electronic Commerce management and technological capability to SMEs is becoming important. Some specialized Electronic Commerce centres are offering short management and technical courses. In the U.S. the Electronic Commerce Resource Centers appear to be playing a key role in the preparation of SMEs for e-commerce. While the impetus is the U.S. defense logistics effort, which is obviously non commercial, the e-commerce managerial and technological capabilities acquired by firms supplying the U.S. defense system can be transposed to commercial use. Other important programs and institutions to bring SMEs and Electronic Commerce together can be found in Australia and Europe. Although Canada has a highly regarded SME technical support system and a variety of programs and incentives for technological modernization of SMEs, Canada does not have dedicated institutional arrangements to promote acquisition of Electronic Commerce capability in SMEs.

The Canadian technology diffusion system, especially the IT component of it, is very much market-based and demand-driven. Therefore, in Canada, tax incentives for training and technological upgrading may be more appropriate or effective than the sorts of dedicated service institutions established elsewhere. No one has yet identified “best practices” in accelerating technological and management learning for Electronic Commerce in SMEs, but this will surely be a salient policy issue in coming years.

BPR meets Electronic Commerce as internal and external integration converge

The link between Business Process Reengineering (BPR) and Electronic Commerce (EC) is currently not a strong one. However, as externally focused ICT applications become linked to internally integrated ICT applications, their relationship is starting to be reinforced. This is particularly visible in the BPR offerings by consulting firms and in recent conferences. Kobielus (1997) associates Electronic Commerce and BPR through the intermediary of workflow. He describes workflow and workflow strategies as the “technical backbone behind the often fuzzy concept of business-process reengineering” (p.7). Many of the workflow management systems that he describes are being developed for Electronic Commerce applications.

The purpose of workflow is to manage the flow of work, information, and communication within organizations. It represents the application of Electronic Commerce in modes internal to the organization, though many of the applications also interface with links external to the organization. In the world of intranets, extranets, and the Internet, the internal - external boundaries become very blurred.

Managing workflow does not imply automating everything an organization does. Processes within an organization must first be analyzed and where appropriate reengineered or redesigned. Only then can the appropriate processes for automation be identified or developed, and technologies applied.

Business Process Reengineering first gained wide spread attention in the early 90s. Identifying and redesigning processes for major organizational changes, versus the continuous incremental improvement advocated by some competing management approaches (especially Total Quality Management) was the goal of reengineering. Information and Communication Technology was always an integral part of discussions about reengineering. It was viewed both as a tool for the reengineering process and as a platform that could make the goals of

redesign possible. The argument was that the potential for innovation and redesign would be limited without the application of ICTs.

The link with Electronic Commerce moves the discussion of ICTs and BPR to the new set of network, web, and multimedia technologies. Questions about the role of BPR in intranet and extranet development are emerging. Included in this discussion are issues of workflow, document management, imaging, and groupware applications. Logistics, BPR, and Electronic Commerce form another cluster of considerations. Furthermore, enterprise-wide application software systems such as SAP bring with them a level of reengineering and also are considered as a reference point for Electronic Commerce applications within an organization.

This section delves into the relationship between business process reengineering and Electronic Commerce, particularly as is relates to the education, training, and skills required by combining these two previously unrelated concepts.

BPR learning environments

University courses related to BPR and Electronic Commerce

Appendix 3 contains a table with examples of the Business Process Reengineering learning environment in the University context. The courses included in the list have BPR as their *core* content. If a course contains a link to Electronic Commerce, it can be identified through the topic and content covered. The rows shaded in grey represent courses offered at Canadian Universities. General observations about the table include:

- There is limited availability of Business Process Reengineering courses at the undergraduate level.
- While several of the courses discuss the link between BPR and Information Technology, few extend this discussion to the rapidly developing set of Electronic Commerce technologies or issues.

University-Industry partnerships for management training

Up-to-date management training in Electronic Commerce requires a certain familiarity with enterprise information systems. As these become integrated suites of previously separate functional applications, their cost and complexity rise, putting them out of reach of university management faculties. When this happens, management training can only cover the theoretical issues involved in BPR and workflow design. Management students will not have had a chance to

look inside the technological black box, and their understanding of the tools and processes of workflow design will be consequently limited.

Software companies have responded to this problem by developing training alliances with universities to establish unique settings for learning about business processes in an Electronic Commerce context. Two firms that can serve as examples of these collaboration opportunities are SAP of Germany, and Action Technologies of the United States. Both of these firms have committed resources to developing alliances with universities. These alliances obviously serve to showcase the company's software as well as develop and educate students who will leave their respective university programs with hands-on experience in the use of the software packages. Such students will presumably be more attractive in the job market for at least as long as the software packages remain popular and in use within organizations.

SAP[5] is the developer of the enterprise-wide application software R/3. Action Technologies[6] are developers of software products for business process and workflow applications. The use of these respective software applications results in redefined processes within an organization. The software is designed to operate within the context of an Electronic Commerce-based technology infrastructure.

These university-industry partnerships usually provide universities the software for free or at a minimal charge, although annual service or maintenance fees may be applicable. Once installed, the software can be used and integrated into a management training curriculum. SAP has more than twenty alliances with universities in North America.[7] Action Technologies has seven partnerships with universities in North America.

Conferences, seminars, training courses, and workshops:

Many management learning opportunities in the realm of BPR are provided through seminars, workshops, training courses, tutorials, and conferences offered by the private sector, especially consulting companies. Here the link between BPR and Electronic Commerce is becoming stronger. The link is not robust enough, however, to assume that every BPR learning event has an Electronic Commerce component. But many events do make reference to the role of information technology in BPR. This relationship now is beginning to

[5] http://www.sap.com/
[6] http://www.actiontech.com/
[7] As an example of an alliance between SAP and a university in the context of a BPR course, see the example at Louisiana State University at http://www.bus.lsu.edu/isds/courses/fall/7525-1/ .

encompass Electronic Commerce technologies as drivers and facilitators in process redesign initiatives.

Appendix 4: Selected Business Process Reengineering Conferences, Seminars, Training Courses, Tutorials, and Workshops (1997-1998) contains a sample of recent learning opportunities in the area of BPR. The type of event - conference, seminar, etc. - is defined by the event organisers. In other words if they have labelled their event a training course, it has been so labelled in the table. The general theme of the event is presented along with any aspect of the event related to Electronic Commerce. The focus of the table is on BPR learning opportunities that do have an explicit link with Electronic Commerce. Little Canadian content could be identified through Web searches in this area.

BPR and Electronic Commerce in management consulting

Management consultants provide another mode for organizations to learn about business process reengineering and Electronic Commerce. Several consulting firms have expanded their definitions of BPR consulting to include Electronic Commerce technologies. Again, the discussion extends from the initial link between BPR and IT to the set of information and communication technologies that constitute the Electronic Commerce environment. The technologies can play a number of roles, including acting as a tool for process analysis and workflow redesign, to use as an integral part of the technologies that enable the redesigned process to be put in place.

For example, Maritime Information Technology, Inc., located in New Brunswick, describes their BPR services as follows:

> At MIT, we work with our customers to determine ways to use technology to gain strategic and/or competitive advantage. After thorough analysis, MIT is able to leverage information technology to enhance the way an organization conducts its business.
>
> BPR has allowed our customers to realize cost savings, obtain better information for decision making, reduce operating expenses and eliminate data rework. (MIT 1998)

The list of enabling technologies for their BPR services includes EDI, client/server computing, imaging, and open systems – all components of Electronic Commerce.

KPMG Canada's approach is slightly different. While MIT focuses on BPR and includes e-commerce technologies as a contributor, KPMG begins first with Electronic Commerce services and then brings in process related functions. For example, part of KPMG's offering includes a business transformation service as

well as supply chain and logistics management. Their view is that Electronic Commerce can play an important role in achieving the desired results in these areas (see Appendix 5: KPMG Electronic Commerce Services).

BPR jobs

A discussion of skills, education, and training would not be complete without some description of the types of employment the learning opportunities can lead to. In this section a brief discussion of jobs available in the area of BPR and Electronic Commerce will be provided.

The link between business process reengineering and Electronic Commerce is perhaps weakest in the area of jobs. Few of the Electronic Commerce jobs identified through web searches identified business process reengineering skills as a needed competency. On the flip side, few business reengineering jobs identified a need for Electronic Commerce skills. The stronger link between process redesign and Electronic Commerce which is emerging in the consulting firms represents the main location of the few jobs in which BPR and Electronic Commerce co-exist. As an example, a large well-known consulting firm is looking for an EDI Business Analyst to work in the firm's Business Process Management practice.

Appendix 6 provides samples of job descriptions with both business process and Electronic Commerce components. The primary emphasis may be one or the other. The full recruiting information for these positions is not included here. Suffice it to say that these constitute descriptions from "real" jobs that were found on the web at the time of this report. Combing the BPR and Electronic Commerce skills sets results in positions which require both an understanding of business process and the technologies upon which the processes operate, as well as those technologies upon which a redesign process could operate. Many of these jobs were for consulting companies and none was explicitly for a position in a Canadian location.

Professional associations and Electronic Commerce management skills: the case of Purchasing

Most professional associations and many emerging professions have prescribed technical and management skills and offer professional development programs to define and certify the practitioner's competency. Furthermore, many professional practices are being transformed by information technologies and so professional associations or guilds have to define levels of information technology literacy as well as integrate new skills into the professional curriculum. This dynamic affects

every profession and occupation, from real estate agents to accountants. A management profession at the centre of the transformations in organizational behaviour and strategy being wrought by Electronic Commerce is that of Purchasing. Purchasing, one of the most important business functions, is being radically changed by the emergence of a host of IT-based procurement technologies including EDI, search engines, electronic auctions, electronic catalogues, electronic mail, and electronic procurement systems such as Merx, the electronic tendering system introduced by the Canadian federal government and seven provinces in October 1997. Many large firms and many government agencies are currently undertaking procurement reform, based upon implementation of new electronic procurement technologies and redesigned procurement procedures. Public sector procurement reform is certainly one of the most important examples of the role played by "government as lead user" that is advocated as a policy measure by the Information Highway Advisory Committee.

In Canada the purchasing profession is accredited by the Purchasing Management Association of Canada (PMAC), which has 6000 members. The Certified Professional Purchaser (C.P.P.) designation is the only Canadian purchasing designation recognized by statute. Certification requires that candidates take four courses in purchasing management and twelve seminar credits. PMAC provides the courses itself at various locations across Canada.

It is instructive to view the effects of the introduction of advanced technology into the work of this profession. One might assume that a greater level of technical competency would be called for, but the story is not so simple. Originally, efficient transaction processing was the goal of the procurement function. As companies exhaust the cost-saving benefits of downsizing and rationalization, they are turning to improvement of purchasing practices and "strategic purchasing" to strengthen their competitiveness. The purchasing function is evolving into a higher management function, provided that purchasing demonstrates that it can add value beyond the administrative tasks of ordering and expediting (Pye 1998). With the emergence of enterprise networks, purchasing is developing "a more comprehensive perspective that also take into account planning, forecasting, and policy issues regarding purchasing control, the management of internal and external relationships, as well as logistics activities such as scheduling" and supply chain management (Segev, Beam, and Gebauer 1997). This is expected to create "dramatic and traumatic change" for purchasers and supply managers, particularly those who have not upgraded the traditional transaction processing skill set (Menzies 1997). About 1400 PMAC members have been certified since the establishment of the program. In a move indicative of the growing knowledge-intensive of the purchasing profession, in 1996 PMAC established the Canadian Purchasing Research Foundation to

support research and education. It has established a chair in purchasing and supply management at the University of Western Ontario.

Although best practice in purchasing is hard to specify, two extreme behaviours among purchasing professionals have been identified.

> i) managers who find ways to wring out every penny possible from their vendors, and ii) the modern managers who work with the customers to standardize, aggregate and consolidate their purchasing with a few suppliers in a "we-can-do-it-together" attitude, to leverage their buying power and to improve the efficiency of the purchasing process. In both cases, the cost of materials is lowered.
>
> The first method foregoes internal purchasing efficiency, and is characterized by transaction-processing activities which many managers call buying activities. The second method lays the foundation for continuous improvement in the activities that determine value for the customers. The second case is dominated by: strategic planning, long-term contract relations with suppliers, market research to keep a constant pulse on the market, and management of relations rather than transactions.
>
> These activities are part of what some managers refer to as modern purchasing. (Iyogun 1998)

Table 13: Essential Skills and Qualities of a Purchasing Manager

Superb communication skills
Computer literacy and technical know-how of new products
Strong negotiation skills
Teamwork and team leadership skills
A thorough understanding of basic purchasing skills (contract writing, purchasing clauses, tax and tariff regulations, transportation and inventory management)
Openness to more personal development
Ability to embrace a global rather than a local perspective
A customer service orientation
Manage the supplier base and work within integrated supplier relationships
Strong academic background an a commitment to ongoing training and development

(Menzies, 1997)

PMAC has identified 83 management competencies and twelve essential management qualities and skills that purchasing managers must have. These are “business-centric” rather than narrow technical skills, which mainly have to do with computer literacy and ability to use new IT products (Table 13). Only thirty or forty percent of purchasers are believed to have these qualities and skills at present (as cited in Menzies, 1997).

The PMAC accreditation program has been thoroughly revised, and the new one (a ten-year program beginning in 1998) differs substantially from the previous one, for which registration has closed. It emphasizes the development of

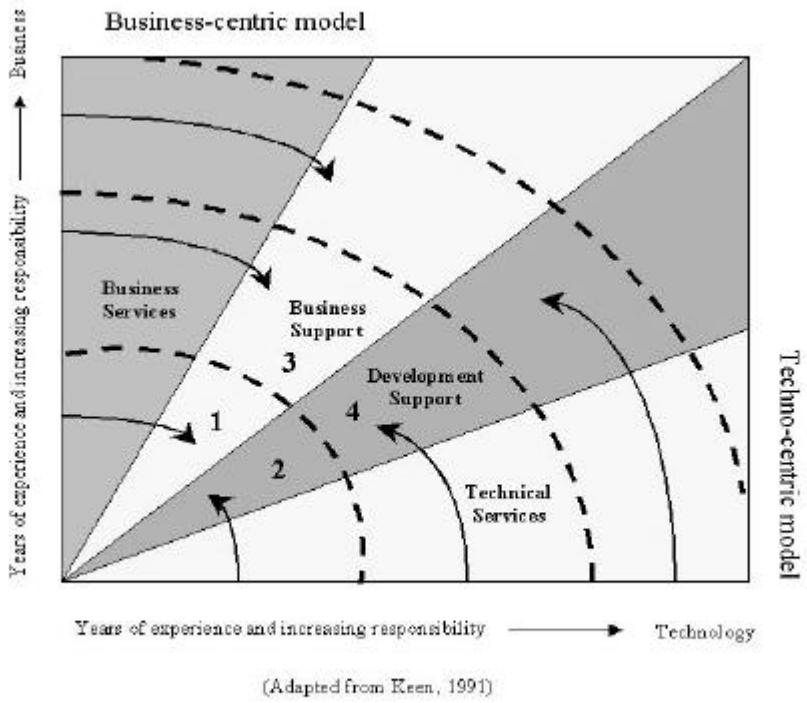
business and organizational acumen as well as the acquisition of profession-specific administrative and technical knowledge (see Appendix 8: Outline of the PMAC 1998 C.P.P. Accreditation Program). In addition to its certification program, PMAC offers twenty-five on-site courses in fundamentals, professionalism, negotiations, materials management and logistics, costs/pricing, purchasing management, legal and contractual issues, international trade issues, and managing supplier relations.

Electronic Commerce management skills: profile and demand

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. For example, the traits and core competencies of successful senior IT executives are indicative of their business and management abilities, which allow them to bridge the worlds of information technology and business (see Table 14).

The disconnect between the IS department and the rest of the firm is legendary. This disconnect 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, as we saw in the case of Techno MBAs. 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. This role corresponds to the career trajectory offered by the Techno MBA. 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.

Figure 1: Emerging Career Trajectories for Electronic Commerce



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. Among the variables that introduce variety into the Electronic Commerce skill set are the following:

- 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. Such individuals frequently seek management education at the MBA level. The nearly 300 “Techno MBA” programs in North America, which we examined earlier, cater to the 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. An emerging trend is to provide a level of technological competency to business students in traditional business disciplines (accounting, human resources, organizational behavior, etc.). Nevertheless, the needs of firms in this respect are not well established. Although many firms say that they prize generalist business skills, the entry points for such people are not as clearly defined 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.
- The emergence of Electronic Commerce and the proliferation of information and communication technologies in firms are driving a restructuring of job roles and responsibilities. In some cases, as we saw earlier with the Purchasing profession, a strong push to upgrade the management and technical skill base of practitioners is taking place. In other cases, for example Webmasters and Electronic Commerce Managers, job titles have become widespread that hardly existed a few years ago. Over 120 different Internet-related job descriptions have been identified (see

Table 14: Critical Traits and Core Competencies of Senior IT Executives

Critical Traits

- Change process manager: ability to participate in or manage change
- Business acumen: building and maintaining a strong sense of and for the mission and vision of the business
- Pathfinder: having a curiosity for technology and how it can be applied to generate business value
- Marketing: ability to sell and market themselves, their vision and their capabilities within and outside the organization to create visibility for themselves, their organization and their enterprise
- Leadership: ability to anticipate, identify and respond to changing business priorities and needs while building and maintaining an "esprit de corps among IS professionals"
- Workaholic: willingness to do whatever it takes to help the business succeed

Core Competencies for Senior IT Executives and IS Organizations

- Flexibility and adaptability
- Ability to manage complexity and continuous change
- Using process as a key capability to enable dynamic product capability
- Understands human behavior vs. organizational structure as the key IS organizational enabler
- Moving to more flexible, "federated" organizational structure to leverage internal and external resources
- Having business foresight and strategic thinking as key competencies

How CIOs spend their time

- 40% on technology issues (planning and project management)
- 30% on business issues (relationship management, policy and service strategy)
- 30% on human resource issues (internal and external)

Source: The CIO Resource Library, http://www.cio.com/CIO/rc_execs.htm

Appendix 7: Internet Human Resource Requirements). These range from completely technical roles such as Unix Internet Programmer to creative development roles such as Multimedia Author or Online Channel Marketing Manager.

- Electronic Commerce-related professions that permit relatively clear description of task, roles, and competencies are able to develop accreditation schemes and specify the competencies required for recognition of attainment of different levels of expertise. Accreditation movements are currently taking place or are established in a number of Electronic Commerce-related professions, including Webmasters, Electronic Commerce managers, and purchasing professionals.
- Electronic Commerce products and services are frequently unfamiliar not just to users but also to sales and marketing personnel, who may need customized training to permit effective performance in an Electronic Commerce environment.
- 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 sum, 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, and a user orientation. The required competencies vary according to the location of the Electronic Commerce project in the firm as well as according to stage of a project's life cycle. As an example of the former, consider KPMG's diverse set of Electronic Commerce services in Canada, each of which targets Electronic Commerce in a different location in the firm: strategic planning, change management, IT planning, supply chain management, and many others (see Appendix 5: KPMG Electronic Commerce Services).

Concerning the sequence of management and skill requirements throughout an Electronic Commerce project's life cycle, consider the seven phases identified by the Manufacturing Information Resources Locator (MIRL 1998). Before a project can be designed and implemented, key people in the firm may need to be given an understanding of the Electronic Commerce technologies and their business value. This is the *awareness training* phase. A *business analysis* allows a company to identify a best case of e-commerce application. *Analysis of requirements* permits the definition of a system that meets the previously

identified needs. The *design* phase selects the specifications of the system. *Implementation* is when the new technology is introduced and people learn to use it. *Integration and validation* ensure that the system performs as planned. In the last phase, the operational system is *maintained* and preparation for a movement to the next system is begun (MIRL 1998). See Appendix 9: MIRL Electronic Commerce Project Life Cycle.

What skills do firms want in Electronic Commerce graduates?

In conjunction with the design and development of UNBSJ's Electronic Commerce program and the activities of the Electronic Commerce Centre, several sets of interviews with sponsors, industry associations, students, and domestic and foreign experts were undertaken to ascertain the nature of the needs for training in Electronic Commerce. We report on some of the results of these interviews here.

The demand for Electronic Commerce skills varies across industries because of varying degrees of involvement in e-commerce. Industries with a declared stake in Electronic Commerce include the mining industry and its equipment supplier industries and transportation service suppliers; 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; healthcare services; information services; travel service providers; and brokers of many sorts. [8] All industries should be interested in Electronic Commerce, but much seems to depend on whether firms or industry associations have appropriate vision or strategy. 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. The latter have frequently become involved in Electronic Commerce through efforts to reduce overhead.

On-line recruiters post job descriptions reflecting this division. With the exception of hardware and software companies (which often seek candidates with an IT background), positions in Electronic Commerce tend to be for senior strategists and relationship managers or for non-technical sales, marketing and customer service people. However, the vast majority of positions called "Electronic Commerce" are technically oriented, requiring system-based skills for EC/EDI managers and Internet skills for Internet managers and coordinators. These are

[8] In June 1997 the trade magazine EC World listed about 150 industry North American industry associations that it considered to have significant involvement in Electronic Commerce.

the skill sets largely produced by university MIS departments or vocational technical Electronic Commerce training programs.

Based on a reading of job advertisements and interviews with industry observers and academic experts, two broad categories of skills and competencies are in demand:

- service providers and business process-oriented Electronic Commerce professors regard Electronic Commerce as a broad approach to linkages with business partners and allies, involving sharing information and processes with them and applying Electronic Commerce in a wide range of inter-business situations, particularly customer service. They place heavy reliance on skills associated with intra- and inter-organizational networking, teambuilding, and relationship management. They emphasize the opportunities created by Electronic Commerce to link organizations not previously regarded as partners to provide a new level of products and services, for example business processes that develop around a new marketing and selling channel. A working knowledge of the industry and of the technologies that facilitate business networking are also considered important by respondents in industry.
- representatives of industries concerned with the transport of physical goods (mining, manufacturing, and transportation) and MIS professors emphasize the analytical skills needed to assess and streamline paper-based processes and the technical skills required to manage related projects and systems as essential to Electronic Commerce management. Industry associations representing constituents whose success depends on managing paper flow associated with receipt, distribution, billing and payment regard Electronic Commerce as a form of paperless office or computer-based office automation.

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. In industry, service providers who do not perceive themselves in the “molecule moving business@ seem more sensitive to the value of sharing information across broadly defined business partnering arrangements. We have collected examples of technical and non-technical “Electronic Commerce” positions from interviews and conversations with observers from industry and academia, as shown in Table 15. [9]

[9] Hundreds of positions in Electronic Commerce are advertised in on-line employment sites such as Career Mosaic, virtually all of them technical positions.

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. What are these business skills for Electronic Commerce that are hoped-for in managers and executives? The plethora of leadership skills and management qualities is listed in Table 16.

Table 15: Electronic Commerce Positions

POSITIONS REQUIRING PRIMARILY TECHNICAL SKILLS
MIS director, MIS manager]
Y2000 project manager
Electronic Commerce/EDI coordinator
Electronic Commerce manager
Electronic Commerce project manager
EC technology specialist
e-commerce site manager
on-line business coordinator or manager, on-line operations manager
POSITIONS REQUIRING PRIMARILY BUSINESS MANAGEMENT SKILLS
Electronic Commerce segment analyst
Electronic Commerce manager
Electronic Commerce project manager
Senior manager or senior executive: CEO, president, vice-president, dean, associate dean, etc.
director, associate director
researcher
registrar, associate registrar, financial aid officer
senior officer
Electronic Commerce coordinator
traditional marketing/distribution titles
webmaster
CIO
operations manager
"ringmaster" or relationship manager
source: UNBSJ/ECC interviews with industry observers and players, 1998

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 is not precisely defined. 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 process, 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. At the same time there is a current and growing need for managers with integrated technical and business management skills of the Techno MBA type.

Table 16: Non-technical (Business Management) Electronic Commerce Skills Required by Industry

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, presentation)
strategic analysis (necessary for any emerging market)
an attitude appropriate for business and Apeople@ management
IT and telecomm technologies
traditional reporting skills
a broad perspective on Electronic Commerce familiar with its many technological options)
a relationship builder
a marketer
charismatic (a leader, and enthusiasm generator, problem solver for other people)
comfortable interacting with government and regulatory bodies
open to change
a fast learner
a non-technical person=s understand of technological security and perceptions surrounding security
ability to contribute to standards of service to constituent
source: UNBSJ/ECC interviews and focus groups

The range of Electronic Commerce related preoccupations across industries is significant. Some industries are "Electronic Commerce immature" and currently dominated by Y2K issues.

Observers in these industries predict a renewed interest in business use of IT once the Y2K crisis is past.

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.

Conclusions: promoting Electronic Commerce management skills development

Electronic Commerce is arising from a huge surge in innovation in Information and Communications Technologies. Electronic Commerce's historical emphasis on inter-firm transactions enabled by information technologies is rapidly intersecting with the intra-firm integration processes driven by application of these same technologies.

It is not easy to acquire and maintain the proper management skills to generate business value from pervasive and confusing technological change, but in view of the nature of competition in a knowledge-based economy, such management skills will have to become widespread within the business community.

Is certification in Electronic Commerce management necessary or possible?

Electronic commerce is not a stand-alone profession with a certifiable skill set. Most jobs with the term "Electronic Commerce" in the title are presently technical positions for EDI professionals. However, the emerging demand for Electronic Commerce management skills is favoring hybrid business-technical skill sets, some with stronger technical competencies and others with stronger business competencies. The business skill sets include general management knowledge, sector and firm-specific knowledge, and a certain familiarity with (but not expertise in) the technology involved. The "business-centric" Electronic Commerce management skill set is not narrowly certifiable, but a general knowledge base can be prescribed. However, Electronic Commerce workers, like IT workers, will require permanent skill upgrading. Hybrid skill sets can be created in-house through cross-training and cross-posting between IT and business positions.

Firms that create hybrid Electronic Commerce business/technology managers must be cognizant that people with such hybrid skills and experience are neither suitable for traditional stovepipe careers in business or IT functions, nor are they likely to aspire to such careers.

How much technical fluency do "business-centric" Electronic Commerce managers require?

Attempts to develop information technology management capability among "business-centric" managers are relatively new. The most common solution is to recruit individuals with a technical background and several years of experience into IT-intensive management positions, usually after receiving business education at the Master's level. A more recent solution is to provide training and other opportunities to persons with a business background in order to give them familiarity with Electronic Commerce technologies.

ICT innovation is resulting in a certain intermingling of technical and business activities within firms, and job positions are emerging for individuals with business backgrounds who have worked in technology-intensive environments or have some responsibility for business activities in which the technical dimension of Electronic Commerce is not negligible. These are "business-centric" positions. The issue is: how much do individuals in these positions need to know about Electronic Commerce technologies, and what is the nature of this skill set? How can it be acquired? Respondents in the business community use such terms as "conversant " or "familiar" with the technology, or "technologically literate" to describe the kinds of skills they are seeking among business managers.

Because this is a relatively new problem, no established solution exists within the educational and business communities. They are experimenting with a variety of solutions, ranging from internal customized training to development of business-oriented Electronic Commerce education in universities.

It may be that the degree of technological familiarity with Electronic Commerce sought in managers will require establishment of a specialized training infrastructure or specialized training programs in Canada: for example, model electronic trading communities, targeted management training programs for young business graduates, joint ventures for cross-training in management and technical areas, or establishment of a shared training facility for a sector or a profession. Ultimately, industry-led initiatives to identify human resource needs and solutions for Electronic Commerce in Canada would reduce some of the learning costs associated with mastery of Electronic Commerce.

How much sector specificity should Electronic Commerce management programs have?

At present, most university-based Electronic Commerce management training programs are either business-centric or have a strong IS component. Most do not focus on a particular sector.

Executives frequently emphasize the need for sectoral and contextual knowledge among managers. Most of the time, such knowledge can only come from years of experience in a business sector. However, formal education could reduce the amount of time it would take to acquire this sectoral knowledge. Furthermore, while the technologies used in applications of Electronic Commerce may be trans-sectoral, their business logic is framed by the conditions in an industry. Therefore Electronic Commerce programs with a particular sectoral focus would appeal to industry. For example, a university program might specialize in the preparation of skilled electronic commerce managers for the telecommunications, health care, or financial sector. Industry might wish to consider the suitability of sponsoring such programs in Canadian universities or colleges.

What should be the relationship between traditional business disciplines and Electronic Commerce?

Currently, several Electronic Commerce programs require a double major, one in a business discipline and one in Electronic Commerce. This arrangement strengthens the business relevance of the Electronic Commerce major and provides the graduate with more than one entry point. While senior executives emphasize the need for business-centric Electronic Commerce skills, recruiters and Human Resource professionals frequently seek candidates with known technical or administrative skills. A double major would hasten the introduction of Electronic Commerce skills into firms through traditional entry points.

Assessment of the Canadian situation regarding Electronic Commerce management skills

In the universities

Introductory business-oriented Electronic Commerce courses are available in several Canadian universities. The University of New Brunswick is the only Canadian university to offer Electronic Commerce as a business major. However nearly every Canadian school of business has at least some faculty members with teaching or research interests in some aspect of electronic commerce, often

from an MIS perspective. Furthermore, a number of recently-established chairs in Canadian universities have something to do with electronic commerce. Examples are the PMAC-sponsored chair in Purchasing at the University of Western Ontario, the Eaton chair in retailing at the University of Toronto, and the Nortel Chair in Electronic Commerce at UNBSJ, which was just announced.

There is no Canadian equivalent to the internationally recognized Electronic Commerce research centres found in some U.S. or European universities. Nor does Canada have a well-developed national network of university researchers and educators in Electronic Commerce, as Australia does.

Simulated, hands-on learning environments for Electronic Commerce are rare in most universities. The promotion of alliances among Electronic Commerce hardware and software vendors and universities could greatly enhance the "hands on" learning opportunities for business students intending to pursue "business centric" careers in Electronic Commerce.

SME support

Canada has a well-developed SME technical support system and a high-level vocational training system located in community colleges that could incorporate elements of Electronic Commerce support. In fact, several community colleges are poised to offer training services in Electronic Commerce, and others will join as demand for training services develops. However, Canada presently does not have a set of institutional and program tools whose purpose it is to diffuse Electronic Commerce technical and management capabilities to SMEs. The stated goal of world leadership in Electronic Commerce by the turn of the century will require the development of very rapid learning capability in the small business sector. The situation should be reviewed and an overall game plan developed.

Policy and program management in the public sector

In the course of our research we found only two kinds of initiatives to develop management skills for Electronic Commerce in the public sector: very high level policy programs in U.S. Ivy League universities, and training programs related to implementation of electronic procurement and supply chain management procedures in the defence sector.

Public-sector managers have a triple responsibility regarding Electronic Commerce. They need to understand the dynamics of Electronic Commerce in the private and not-for-profit sectors and have an appreciation of the economic,

technological, and organizational issues involved. They need to have specific Electronic Commerce program or project management skills related to the areas of service delivery in which they have responsibility, as for example when governments take the lead in developing an electronic purchasing system. And, they need a much firmer grasp of policy issues than Electronic Commerce managers in the private sector do.

For these reasons, the Electronic Commerce management skill set for public sector managers cannot be a simple extrapolation from the management corpus presently available to private sector managers. A number of courses on the policy and legal aspects of Electronic Commerce are available in universities, but because of their scheduling and delivery methods they probably do not meet the training requirements of public sector managers. A knowledge economy requires a skillful public sector. A management research and training initiative oriented toward Electronic Commerce policy and public administration, and tailored to the learning needs of Canadian public sector managers, might be worth considering.

Summary of proposed next steps

We believe that the five following initiatives could contribute substantially to the strengthening of Electronic Commerce management capability in Canada.

1. Sectoral Electronic commerce management skill development initiatives

Much time and effort would be saved if the major Electronic Commerce-using industry consortia or industry associations would sponsor Electronic Commerce management education and training initiatives in Canada. These could include degree programs in universities, certification programs where appropriate, short on-site courses, executive seminars, and associated business research projects.

2. A National Electronic Commerce youth management internship program

Of particular concern is the development of opportunities for in-house management training for young graduates with a “business-centric” approach to Electronic Commerce. An initiative to bring young business school graduates into working Electronic Commerce environments as management interns would represent an excellent investment in the future.

3. Industry-sponsored skills mapping and competency modelling initiatives

Electronic Commerce “best practices” and management competency profiles should be identified and vetted under the auspices of the industries that need the management skills. At this point in the evolution of Electronic Commerce, a

competency modelling or skills mapping initiative in one or more industries would be very useful.

4. Review of Electronic Commerce-readiness of the Canadian SME support system

The Canadian SME support system should be reviewed for Electronic Commerce-readiness, and proposals for adjustment or addition made to the appropriate authorities and stakeholders.

5. Review of Electronic Commerce management training needs in the public sector

The management skills required for Electronic Commerce-readiness in the public sector should be reviewed and possible training needs identified.

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Appendix 1: Electronic Commerce Knowledge Structure

- Electronic Commerce Technologies and Skills
  - Internet Literacy
  - Internet Access
  - Internet Organizations
- Content Webmaster
  - Analysis and Design
  - Website Design
  - Rapid Web Development
  - Design of Virtual Organizations
  - HTML Editors, Translators
  - Scripting
    - Javascript
    - Active X
  - Programming
    - Java
    - CGI
    - PERL
    - Dynamic HTML
  - Other
    - HTTP cookies
    - HTML Authoring Tools
- Technical Webmaster
  - Communication and Networking
    - Castanet
    - Communication Highways
    - ISDN & ATM
    - Intranets
    - Internet Phone
  - Operating Systems
    - UNIX
    - Server Software
    - Web server software
    - Web servers
  - Other

- Push-pull technologies
- Copywriting
- Copywriting skills
- Multimedia Design

Imaging and viewing
- Image mapping
- Imaging software
- Viewers

Conferencing
- Video conferencing
- Audio conferencing

Other
- Virtual Reality Modeling Language

Multimedia
- Audio/Video streaming

Electronic Commerce Issues

Censorship
- Internet censorship
- Filtering tools and techniques

Copyright

Ethics
- Internet ethics

Legal
- Regulation Law and Policy
- Internet organizations
- Privacy
- User authentication

Security
- Internet security
- Computer viruses
- Firewalls
- Web servers
- Data encryption

Electronic Commerce Applications and Concepts

Inbound Logistics
- Business Process Reengineering
- Logistics
- Internet Access
- Design of Virtual Organizations
- Operations

- Electronic Data Interchange
- Shopping Carts
- Outbound Logistics
- Marketing and Sales
- Advertising
- Marketing
- Service
- Web TV
- Electronic Money
- Electronic Commerce Industries
- Construction
- Manufacturing
- Motor Vehicle Manufacturing
- Retailing Trade
- Computer and Software Stores
- Cosmetics, Beauty Supplies and Perfume Stores
- Transportaion
- Parcel Shipping
- Information
- Publishing
- Service Providers
- Finance and Insurance
- Commercial Banking
- Brokerage
- Educational Services
- Health Care and Social Assistance
- Hospitals
- Accommodation and Food Services
- Hotels (except casinos) and Motels
- Restaurants
- Amusement and Recreational Services
- Professional Sports Clubs and Promoters

(Source: ISWorld Net, 1998)

Appendix 2: University courses in Electronic Commerce with on-line syllabi

Online Electronic Commerce course syllabi, 1995-1998. Courses in Canadian universities are highlighted. The courses listed here were available online in March 1998.

Title	Instructor	University	Country	Date	Focus	Level	Core textbook	URL
Electronic Commerce and Marketing	Brynjolfsson /Little	Massachusetts Institute of Technology	USA	Winter / Spring 1998	General / Marketing	Graduate	Kalakota & Whinston, Electronic Commerce: A Manager's Guide (1997)	http://web.mit.edu/ecom
Computer-Mediated Communication and Electronic Commerce	Lohse	University of Pennsylvania	USA	Winter / Spring 1998	General / technical	Graduate	Course packet	Http://opim.wharton.upenn.edu/~opim314/index.html
Web Security and Commerce	Resnick and Honeyman	University of Michigan	USA	Winter / Spring 1998	Technical	Graduate	Kaufman, Perlman, and Specter, Network Security: Private Communication in a Public World (1995); Garfinkel and Spafford, Web Security & Commerce.	http://www.si.umich.edu/~presnick/courses/winter98/index.html
Electronic Commerce	Versaggi	DePaul	USA	Winter / Spring 1998	General	Graduate	Kalakota & Whinston, Electronic Commerce: A Manager's Guide (1997)	http://versaggi.net/ecommerce/a/syllabus.htm

Business Logistics Modeling and Electronic Commerce	Links	University of Saskatchewan	Canada	Winter / Spring 1998	Logistics	Undergraduate	Cases and lectures	http://www.commerce.usask.ca/faculty/links/pom_495.htm
Business and the Internet: Strategy, Law, and Policy	Hurley and Camp	Harvard University	USA	Winter / Spring 1998	Policy orientation	Graduate	Various	http://www.ksg.harvard.edu/iip/stp307/index.html
Riding the Information Superhighway	Jankowski	University of California, San Marcos	USA	Winter / Spring 1998	General	Undergraduate	No required text. Online references and suggested texts	http://www.csusm.edu/public/jankowski/superhighway/syllabus.html
Electronic Commerce	Marcolis	University of Calgary	Canada	Winter / Spring 1998	General	Graduate	Kalakota & Whinston, Electronic Commerce: a Manager's Guide (1997)	http://www.acs.ucalgary.ca/~marcolin/eccalgary.html
Development of Information Systems for Electronic Commerce	Havn	Technical University of Denmark	Denmark	Winter / Spring 1998	General	?	Various book chapters	http://www.cti.dtu.dk/Personal_homepages/eh/Kursusplan.html
Commerce on the Information Highway	Galleta	University of Pittsburgh	USA	Winter / Spring 1998	General	Undergraduate	Various on-liine	http://www.pitt.edu/~galletta/commerce.html

Electronic Commerce	Matula	New Mexico Highlands University	USA	Winter / Spring 1998	General	Mixed graduate / undergraduate	Choi, Whinston, & Stahl, Economics of Electronic Commerce (1997); Kalakota and Whinston, Readings in Electronic Commerce (1996)	http://business.nmhu.edu/faculty/Tlm535a.htm
Technology and Marketing	Rao, Stayman, Kadiyali	Cornell University	USA	Winter / Spring 1998	Marketing	Graduate	Course packet/online readings	http://www.gsm.cornell.edu/courses/NBA633/Syllabus98.html
Competing in the Digital Economy	Anderson	Norwegian School of Management	Norway	Winter / Spring 1998	International	Graduate	Cairncross, The Death of Distance (1997), and Garfinkel & Spafford, Web Security and Commerce (1996)	http://www.espen.com/courses/gra2329/index.html
Electronic Commerce	Heller & Hoffman	George Washington University	USA	Winter / Spring 1998	General	Graduate	Course packet/online readings	http://www.seas.gwu.edu/classes/cs701/syllabus.html
Organizations and Electronic Commerce	Hajnal	University of New Brunswick, Saint John	Canada	Winter / Spring 1998	Workflow	Undergraduate	Kobielus, Workflow Strategies (1997)	http://www.unb.ca/admin/chajnal/ba2506/schedule.html
Electronic Commerce	Magal	Bowling Green State University	USA	Winter / Spring 1998	General / technical	Undergraduate	Online	http://www.amis.cba.bgsu.edu/staff/smagal/classes/ec/index.html
Electronic Commerce on the Internet	Widmeyer & Rafaeli	University of Michigan	USA	Winter / Spring 1998	General	Graduate	Kalakota & Whinston, Electronic Commerce: A Manager's Guide (1997)	http://www.umich.edu/~cisdept/Grad/CIS518/cis518-syllabus.html

Electronic Commerce	Orman	Cornell University	USA	Winter / Spring 1998	General	Graduate	Course packet/online readings	http://www.gsm.cornell.edu/courses/nba601/
Internet Business Opportunities	Jones	University of North Carolina	USA	Winter / Spring 1998	Online management	Graduate	Cronin, Doing More Business on the Internet (1995); Ellsworth & Ellsworth, The New Internet Business Book (1996); Schwartz, Webonomics (1997)	http://itr.bschool.unc.edu/courses/sp98/mba/busi236/001/index.asp
Implementing Electronic Commerce and Intranets	Rafaeli	University of Michigan	USA	Winter / Spring 1998	Technical	Graduate	Most online	http://cobb.bus.umich.edu:443/cis742/
Electronic Commerce	Riggins	Georgia Institute of Technology	USA	Fall 1997	General	MBA	Kalakota & Whinston, Electronic Commerce: A Manager's Guide (1997)	http://riggins-mgt.iac.gatech.edu/mgt6056/outline.htm
Introduction to Electronic Commerce	Davis	University of New Brunswick, Saint John	Canada	Fall 1997	General	Undergraduate	Kalakota & Whinston, Electronic Commerce: A Manager's Guide (1997)	http://www.unb.ca/admin/cdavis/BA2123/BA2123.html
Electronic Commerce	Krishnan	Carnegie Mellon	USA	Fall 1997	General	MIS	Kalakota & Whinston, Electronic Commerce: A Manager's Guide (1997)	http://www.heinz.cmu.edu/project/ec/90-742.html

International Electronic Commerce	Gilbert, Kendall & Lo	Nanyang Technological Institute	Singapore	Fall 1997	International		Kalakota & Whinston, Electronic Commerce: A Manager's Guide (1997)	http://www.nanyangmba.ntu.edu.sg/courses/b6732/
Internet, Electronic Commerce, and Strategic Information Systems	Keng	University of Nebraska, Lincoln	USA	Fall 1997	Information Systems	graduate	Applegate, McFarlane, McKenney, Corporate Information Management Systems (1996); Comer, The Internet Book (1997)	http://www.ait.unl.edu/doc2/faculty/siau/mis.htm
Internet for Business	Trivison and Brhel	David N. Meyers College	USA	Fall 1997	General	Undergraduate	Various on-line	http://ellen.dnmyers.edu/current/mg282syl.htm
Marketing in a Computer-Mediated Environment	Hoffman	Vanderbilt University	USA	Fall 1997	Marketing	MBA	Lemay Teach Yourself Web Publishing with HTML 3.2 in a Week (1997); Schwartz Webonomics (1997)	http://www2000.ogsm.vanderbilt.edu/hoffman/course_outline.htm
Le commerce sur Internet	Ferrand	Université d'Ottawa	Canada	Fall 1997	General	Graduate	Vince, Faire des affaires sur Internet,(1997)	http://www.admin.uottawa.ca/staff/ferrand/6670A97/index.html
International Electronic Commerce	Carmel & Cohen	American University	USA	Fall 1997	International	Graduate	Kalakota and Whinston, Frontiers of Electronic Commerce (1996)	http://www.kogod.american.edu/MOGIT/ec97.htm
Electronic Commerce and Internet Law	Gidari and Coie	George Washington University	USA	Fall 1997	Law	Graduate	Various; many online	http://www2.law.washington.edu/LawSchool/SpecialPrograms/intlaw.html

Issues in Electronic Commerce	Scott	Concordia University	Canada	Summer 1997	General	Upper-level undergraduate	Kalakota & Whinston, Electronic Commerce: A Manager's Guide (1997); Johnson, Johnson & Handa, Getting Canada Online (1997)	http://www.ganymede.com/e_commerce/outline.htm
Doing Business on the Internet	Klein	Harvard Extension School	USA	Winter / Spring 1997	Marketing	extension	Schwartz, Webonomics (1997); Komenar, Electronic Marketing (1997)	http://lab.dce.harvard.edu/extension/css103/
Network Commerce	Roldan	University of California, Berkeley	USA	Winter / Spring 1997	General / technical	Undergraduate	Various on-line	http://haas.berkeley.edu/~wba248d/
Electronic Commerce	Dos Santos	University of Louisville	USA	Winter / Spring 1997	General	Graduate	Kalakota & Whinston, Frontiers of Electronic Commerce (1996)	http://dossantos.cbpa.louisville.edu/courses/ecomm/About.html-ssi
Electronic Commerce in Theory and Practice	Wensley	University of Toronto	Canada	Winter / Spring 1997	General	Undergraduate	Various handouts and online resources	http://www.mgmt.utoronto.ca/~wensle/2703lect/2703read.htm
Marketing and the Internet	Brown	University of Delaware	USA	Winter / Spring 1997	Marketing	Undergraduate	Various on-line and handouts	http://www.udel.edu/alex/imark/
Marketing and the Internet	McCann	Duke University	USA	Winter / Spring 1997	Marketing	Undergraduate	Online and handouts	http://www.duke.edu/~mccann/mktint97.htm
Electronic Commerce	Kambil	New York University	USA	Winter / Spring 1997	General	?	Various on-line and handouts	http://kambil.stern.nyu.edu/teaching/ecomm2/Syllabus.html

Marketing and the Inernet	McCann	Duke University	USA	Winter / Spring 1997	Marketing	undergraduate	Online resources and inclass handouts	http://www.duke.edu/~mccann/start491.htm
Information Superhighway	Iacono	Boston University	USA	Winter / Spring 1997	General	Graduate	Various on-line and handouts	http://web.bu.edu/SMGMIS/is823/syllabus.htm#background
Electronic Commerce	Dekleva	DePaul University	USA	Winter / Spring 1997	General	Graduate	Kalakota and Whinston, Electronic Commerce: a Manager's Guide (1997)	http://condor.depaul.edu/~sdekleva/documents/mis798/syllabus.html
Computers and Modern Organizations	Roldan	University of California at Berkeley	USA	Fall 1996	General	Undergraduate	Various on-line and handouts	http://haas.berkeley.edu/~ba147/
Electronic Commerce	Whinston	University of Texas	USA	Fall 1996	General	Undergraduate	Kalakota & Whinston, Frontiers of Electronic Commerce, (1996)	http://cism.bus.utexas.edu/abw/syllabus.html
Use of the Internet for Business and Commerce	Goren and Kendall	Nanyang Technological University	Singapore	Fall 1996	General	Graduate	Various on-line	http://www.ntu.ac.sg/nbs/mba/courses/b6533-july_1996/index.htm
Electronic Commerce	Brynjolfsson /Little	Massachusetts Institute of Technology	USA	Winter / Spring 1996	General	?	Kalakota & Whinston, Frontiers of Electronic Commerce, (1996)	http://ccs.mit.edu/15967/syllabus.html#readings
Organizational Implications of Information Systems: Electronic Commerce	Mooney	University College, Dublin	Ireland	Winter / Spring 1996	General	Graduate	Various online and handouts	http://midir.ucd.ie/~jmooney/ecomm96/schedule.html

Marketing and the Internet	McCann and Gallagher	Duke University	USA	Winter / Spring 1996	Marketing	Undergraduate	Various online resources and class handouts	http://www.duke.edu/~mccann/home491.htm
Using IT in a Global Economy	Anderson	Norwegian School of Management	Norway	Winter / Spring 1996	General	Graduate	Negroponte, Being Digital (1995); McKenney, Waves of Change: Information Processing Design as a Source of Competitive Advantage, (1994); Utterback, Mastering the Dynamics of Innovation (1994)	http://www.bi.no/dep2/infomgt/courses/gra2329e.htm
Electronic Commerce: Business Use of the Internet	Hadidi	University of Illinois at Springfield	USA	Fall 1995	General	Graduate	Cronin, Doing Business on the Internet: How the Electronic Highway is Transforming American Companies (1994); Resnick & Taylor, The Internet Business Guide: Riding the Information Superhighway to Profit (1995).	http://www.uis.edu/~hadidi/ecomm.html#moc13
Electronic Commerce	Ives	Southern Methodist University	USA	Winter / Spring 1995	General	Undergraduate	Various online resources and class handouts	http://www.cox.smu.edu/mis/ecommcourse.html

Appendix 3: Selected Online University Courses on Business Process Reengineering, 1996 - 1998

Title	Instructor	University	Country	Date	Focus	Level	Required Textbook	URL
Business Process Analysis and Design	Dewan & Pinker	University of Rochester	USA	Winter / Spring 1998	BPR & role of IT in enabling and facilitating change	MBA	Davenport, Process Innovation (1993) / Hammer & Champy, Reengineering the Corporation (1993)	http://rdewan.ssb.rochester.edu/415/default.htm
Organizations and Electronic Commerce	Hajnal	University of New Brunswick, Saint John	Canada	Winter / Spring 1998	Workflow, Electronic Commerce, Process Analysis and Redesign	Undergraduate	Kobielus, Workflow Strategies (1997)	http://www.unb.ca/admin/chajnal/ba2506/info.html
Business Process Reengineering	Laguna	University of Colorado	USA	Fall 1997	Intro to BPR, Process analysis, Simulation	Undergraduate	Cross, Feather, & Lynch, Corporate Renaissance (1994) / Hammer & Champy, Reengineering the Corporation (1993)	http://www-bus.colorado.edu/Faculty/Laguna/Mgmt4060.html
Design of Computer Information Systems	Watson	Louisiana State	USA	Fall 1997	Business Information systems, BPR, and SAP	PhD, MBA, MIS	Course packet / Davenport, Process Innovation (1993) [recommended text]	http://www.bus.lsu.edu/isds/courses/fall/7525-1/
Reengineering	Nolan	Harvard	USA	Winter / Spring 1996	Design of core business processes, approaches for managing the on-going business transformation	MBA	Hammer & Stanton, The Reengineering Revolution (1995)	http://www.hbs.edu/mis/reengineer/

Quality & Productivity through Business Process Reengineering	Frankenberger	Georgia College & State University	USA	1996-1997	Intro to BRP, process mapping, SPC	Undergraduate	NA	http://www.gac.peachnet.edu/acad_affairs/school_business/syllabi/MGT446.html
Reengineering the Organization	NA	Athabasca University	Canada	Winter / Spring 1996	Reengineering and Human Resource Management	Undergraduate	Betcherman, McMullen, Leckie, & Caron, The Canadian Workplace in Transition (1994) / Hammer & Champy. 1994. Reengineering the Corporation / Harvey, The Condition of Postmodernity (1989)	http://www.athabascau.ca/html/depts/eiros/indrel/idrl317c.htm
Business Process Reengineering	NA	University of Port Elizabeth	South Africa	NA	Intro to BPR, process modeling, IT and BPR	Mixed graduate / undergraduate	Course packet / Hammer, Reengineering the Corporation	http://www.cs.upe.ac.za/wrsz4/
Business Process Reengineering	NA	McMaster	Canada	NA	BPR, Info Systems, Process Analysis	MBA	NA	http://www.business.mcmaster.ca/mba/mbamsis.htm
Reengineering Electronic Business Processes	NA	Monash University	Australia	NA	Applying reengineering theory to the implementation of E-Commerce	Graduate	NA	http://www-cec.buseco.monash.edu.au/courses/graddip.htm

Appendix 4: Selected Business Process Reengineering Conferences, Seminars, Training Courses, Tutorials, and Workshops (1997-1998)

Event	Event Type*	Country	Date	Event Theme and links to e-commerce	URL
Business Process Reengineering and Supporting Technologies for Electronic Commerce [in conjunction with 9th International Conference on Database and Expert Systems Applications]	W	Austria	24-28 August	Reengineering of existing business processes to address the rapid growth of the Internet market and cross the chasm between organizational structures and e-commerce. Link: General conference theme.	http:www.di.uoa.gr/~dexa98/e-commerce.html
BPR Europe 98	C	UK	14-17 September	Pragmatic Process and Knowledge Management: best business process and knowledge management solutions. Link: Session on "Business Technologies that Make a Difference."	http://www.tticom.com/bpreurope/callforpapers.htm
Giga Information Group Business Process and Workflow Conference: Integrating People, Processes and Technology	C	UK	22-24 October	Best practices for reengineering business processes and evaluating workflow or imaging. Link: Sessions on e-commerce [e.g. Intranets and e-commerce - threat or opportunity for workflow implementations?	http://www.waria.com/bpwe97.html
City University of Hong Kong: Information Technology Centre for Business Process Reengineering	S / T	China	Ongoing	Series of seminars to foster the collaboration and communication between universities and industry in order to improve the quality of BPR through the innovative use of information technologies. Link: Though seminar and course topics: e.g. Internet/Intranet for Business Applications; Virtual Corporations: Challenges and opportunities for business reengineering; Reengineering through Electronic Commerce	http://itcbpr.cityu.edu.hk/
Genesis Development Corporation	T	USA	Ongoing	Series of transition management /BPR courses. Link: BPR and IT courses.	http://www.genesis-dev.com/suretrack/education

Department of Defense Electronic College of Process Innovation Training Center	T	USA	Ongoing	Tools and Techniques for Business Process Reengineering Link: EDI courses.	http://www.dtic.mil/c3i/bprcd/
CyberMarché	C	USA	Ongoing	Courses and seminars on how to develop new business opportunities by integrating the latest computer technologies into your organization Link: BPR Course content emphasizing Electronic Commerce technologies.	http://cybermarche.dmssoft.com/ [Software development and consulting in the area of collaboration technology for the Internet and Intranet]
Information Balance, Inc.	W	CDN	Ongoing	This workshop introduces the concepts of Business Process Reengineering, designed to build on the skills of Data and Process Modellers. This course will show how the Activities and Data described in these models can be used as the building blocks of Workflows within the business.	http://www.infobal.com/ [Training and consulting services in Information Technology]

* Event type: C = conference, S = seminar, T = training course, U = tutorials, W = workshop

Appendix 5: KPMG Electronic Commerce Services

- Digital Strategies, for assistance in integrating Electronic Commerce into corporate marketing strategies.
- Business Transformation Services, a change management service.
- Strategic and Technology Services, which provide assistance on Electronic Commerce infrastructure, including electronic payment facilities.
- Strategic information Technology Planning, for strategic planning of the IT function.
- Supply Chain, for Electronic Commerce in logistics management.
- Customer Value Management, for Electronic Commerce applications linking a firm's customer service, sales, and marketing operations.
- Knowledge Management, for converting digital information into knowledge.
- Risk management, to identify risks and find solutions to them.
- Security, to provide controls ensuring to ensure the integrity of information.
- WebTrust, a service to evaluate a firm's adherence to accepted standards for security of personal information of clients.
- System integration, to supply the information systems to realize a firm's Electronic Commerce strategy.
- E-commerce tax minimization, to meet legal requirements while reducing tax liabilities
- E-commerce assurance, to ensure the accounting systems for Electronic Commerce

(Source: KPMG, www.KPMG.ca)

Appendix 6: Examples of job descriptions combining skills related to BPR and Electronic Commerce

Job Title	Job Description
EC/EDI Consultant	Assist in the selection and implementation of an EC/ECI solution for this enterprise environment. Knowledge of existing and emerging EC/ECI system technology is required and should be reported by at least 3-5 years of enterprise EDI system implementation experience. The successful candidate will be required to document the existing EDI environment as well as any newly implemented processes. Resolution of EC/EDI technical issues will be part of day-to-day responsibilities of the engagement. Although hands-on technical skills in EC/EDI will be essential, soft business skills necessary to interface with business unit points-of-contact will be important as well.
BPR Consultants	You will be working on a variety of ERP systems include SAP, Baan, etc. Do you consider your self the best of the best? Do you have a manufacturing, logistics, supply chain or financial background? At least 2+ years in re-engineering on large-scale ERP systems. Experience on: as-is, to-be, gap analysis, re-engineering, software selection, methodologies, systems implementations. Several years of consulting experience required. MBA preferred, but not required. Must have excellent communication skills and attitudes.
Business Systems Analyst	Analyzing and interpreting business processes and requirements for electronic software distributions (ESD) and Electronic Commerce (EC) project. Perform system integration testing and developing acceptance test scripts. Produce application documentation users guides and procedures. Act as a liaison between key users, and the technical development team. Skills required: strong analytical background with the ability to problem solve; effective communication in visual, verbal and written formats; must be knowledgeable about high tech software manufacturing and distribution processes; able to translate unorganized business needs into a set of systems needs that are prioritized base on impact to the business; Oracle, SAP, Baan or PeopleSoft experience with focus on manufacturing and distribution applications/modules; e-commerce experience with a global software company is desired.
Electronic Commerce Consultant	EDI, Electronic Commerce, Internet, WWW processes, TCP/IP, ActiveX, strong analysis skills, understanding of business processes, exceptional interpersonal communications skills. Opportunities available for individuals with all levels of experience. Candidates need the ability to understand the business process/issues associated with facilitation and setting up Electronic Commerce within large organizations.

Appendix 7: Internet Human Resource Requirements

Source: Cyber Review, 1996. http://www.cyberm.com/cr12-hr.html

CREATIVE DEVELOPMENT	WWW Managing Editor WWW Creative Director Web-Site Producer Web Designer – Shockwave User Interface Designer Senior Graphic Artist	Multimedia Author Internet Content/ Creative Developer Graphic Artist/HTML Authoring, Webpage Designer New Media Creative Director/Art Director	Web Spinner/Web Weaver Design Engineer 2D Artist/Animator Senior Art Director Internet Content Evangelist Web Content Engineer Content Server Engineer
TECHNICAL DEVELOP-MENT SOFTWARE	WWW Application Specialist Architect (Internet) WWW Information Systems Manager WWW Presence Engineer Web Technical Guru Website Developer Web Tools Developer Web Technical Manager Web Programmer Web Engineer Web Analyst/Developer Unix Internet Programmer Technical Web Engineer Technical Web Programmer Web Project Coordinator Product Mgr, Internet Services	IS Web Tools Architect Internet Project Server Engineer Internet Programmer/Analyst Web Site Implementor Internet Developer Internet Components Software Developer Engineer Internet Applications Specialist Internet Applications Developer Internet Analyst I.T. Engineer, Web Development I.T. Engineer, Web Document Management I.T. Engineer, Web Developer C++ Programmer, Electronic Publishing Internet Mail Server QA Cyberdog SQA Engineer	Online Systems Programmer Internet Technical Manager Internet/Winsock Software Engineer Internet Software Engineer Senior Internet Application Developer/Architect Unix/Web Site Administrator Product Mgr, Internet Performance Director, Internet Applications Technical Advisor-WWW Sr. Internet Application Engineer Sr. Consultant, Electronic Commerce & Web Technology Senior Software Engineers (Web Development)
JAVA	Java/Visual C++Developer Java Runtime Engineer Java Server GUI Software Engineer Java Performance Engineer Java API Technical Writer	Java QA Runtime Engineer Software Manager, Java Enterprise Systems Java Portability Engineer Java Services Architect Java Applications Engineer	Java Engineer Manager Computer Scientist/Java HotJava Software Engineer JavaScript Software Engineer JavaBeans Engineer Java Web Server Technical Writer
MARKETING & SALES	Web-Site Enhancement Service Sales Technical Marketing Manager Sr. Sales Engineer Networks/Web Online Channel Marketing Manager	Internet Marketing Manager Internet Business Marketing Internet Business Development Manager Internet Sales Account Manager Internet Research Analyst Internet Sales And Marketing Agents	Internet Business Consultant / Account Executive Director of Training and Marketing for Internet Resource Educational Seminars Internet Technical Marketing Specialists Internet Researcher
NETWORK SECURITY	Software Engineering Consultant - Internet Security Software Engineer - Internet Security High Speed Data Internet Access Technician	Network Operations Engineer Internet Network Security Software Engineer Traffic Coordinator	Internet Security Software Engineer Product Marketing Manager - Internetworking Internet Infrastructure Engineer
WEBMASTERS	Web Master Internal Web Master	I.T. Engineer, Web Master Corporate Web Master	Senior Webmaster Assistant Webmaster
INTRANETS	Product Manager, Intranet Services	Intranet Marketing Manager Intranet Applications Software Engineer	Product Line Manager, Intranet Solutions Intranet Development Project Leader
OTHER	Web Surfer/Web Traffic Plan Specialist Web Operations Manager Producer, Search Service	Internet Guru Associate Producer - Web News And Reference Cyberjournalist	Business Analyst/Team Leader/ (Web Development)

Appendix 8: Outline of the PMAC 1998 C.P.P. Accreditation Program

http://www.pmac.ca/ecpp2.htm

Stage I-- Introduction to Strategic Purchasing and Supply Management

Part one: Three-day Institute live-In

Part two: 15 weeks (90 classroom hours, likely three hours twice a week)

Start date: Fall, 1998

Stage II -- Purchasing and Supply Management Practices, Tools, and Techniques

15 weeks (90 classroom hours)

Start date: Winter, 1999

Stage I begins with a three day live-in (in-residence) that introduces participants from the same Institute to each other and to the concepts, topics and techniques that will be covered in the program. Parts one and two of the first stage introduce a wide range of concepts, tools and techniques. Stage II, which does not have a live-in component, but consists of class lectures and home study, builds on Stage I. Together, the two stages provide a strong grounding in the field as well as introduce a strategic and integrative approach. Some of the topics covered:

-purchasing techniques and supply chain management

-strategic planning, strategy analysis, implementing plans and visions

-managing change

-entrepreneurship

-environmental issues: including principles and tools for greening purchasing activities

-communicating effectively

-new technology applications in purchasing

-negotiations, conflict management, facilitation

-legal requirements in purchasing: law of contract, competitive bid contracting, etc.

-global strategies, international alliances, global supply chains

-professionalism and ethics

-understanding business processes--marketing, legal, and human relations

-logistics and transportation, information technology in logistics, design of systems, international logistics

-Total Quality Management, concepts and implementation, ISO 9000

Stage III -- Strategic Purchasing and Supply Management

Part one: Three-day Institute live-in

Part two: 15 weeks (60 classroom hours likely four hours per week)

Start date: Fall, 1999

Stage IV -- Strategic Integration and Supply Chain Management

15 weeks (60 classroom hours likely four hours per week)

Start date: Winter, 2000

Together, Stages III and IV build on the earlier stages with an increased emphasis on strategic planning, emerging trends in business, the complexities of management, the supply chain, operations and quality management, strategic use of logistics, managing relationships, benchmarking and international business activities.

Other subjects include:

-external business environment analysis, risk analysis and the development of sourcing strategy

-operations management, process analysis, inventory management and control, forecasting techniques, and production planning, material requirements planning, just-in-time manufacturing and customer response

-development of strategic sourcing plans

-formulating and executing strategic plans, selling plans to management, identifying potential strategic alliances, solicitation and evaluation of prospects, negotiation of alliance agreements

-global business: global procurement and cultural sensitivity and appreciation

-cross-functional teaming and its extension to global purchasing

-organizing for total quality, total quality and supply chain management, ISO 9000 and 14000, implementing ISO

-benchmarking benefits and methods, benchmarking suppliers

Stage V -- Advanced Strategic Supply Management Course

One week (75 hours of classroom lectures) national in-residence course. Brings together participants from across the country--all Institutes.

Start: Summer, 2000.

The final stage (Stage V) is a national one-week live-in course, integrating the elements of the stages before it and with an emphasis on: developing strategic sourcing plans, on the international business environment and global supply chain management, strategic use of supply chains, information technology in supply chain management, working with other cultures, trends in international purchasing and logistics, environmental issues, ethical decisions, TQM, negotiations, integration of operations management and supply, advanced communications and presentations training, and leading-edge management practices.

Appendix 9: MIRL Electronic Commerce Project Life Cycle

Source: Manufacturing Information Resource Locator, http://www.nemonline.org/mirl/ec/lifecycle.htm

Below are the seven stages of the EC life cycle. Each is linked to resources that are useful in managing this stage.

- *Awareness Training*
- *Business Analysis*
- *Requirements Analysis*
- *Design*
- *Implementation*
- *Integration and Validation*
- *Maintenance*

(1) Awareness training is done to give key people in a company a basic understanding of what a technology is, what it can do for them, and where resources can be found (e.g. consultants, training) to make decisions about implementation. Working at this stage assumes that people know nothing or little about the technology and feel a need to know more. It provides people with a framework for intelligent discussion and planning about a particular form of EC.

(2) Business Analysis. Once there is awareness it is all to easy to jump to the detailed planning of stage 3 - requirements analysis. But business analysis is critical if EC is to provide maximum value to an organization. The worst case is that without business analysis, EC will be counterproductive. The more likely possibility is that without deliberate business analysis EC will have some benefits, but with greater expense and less return than should be the case. The goal of business analysis is to move a company toward the best case, i.e. an EC environment that will make the company more efficient, more productive, and more competitive. One impetus for business analysis might involve technology, as in:

- "My customer told me to do EDI", or
- "I see my competitor using the Web and I think I better do something".
- A second starting point may be a more general business need, into which EC can be factored as part of the solution, as in:
  I'm having trouble filling my orders because my suppliers don't deliver on time.
- We are running into trouble because its increasingly difficult for our sales staff does not fully understand the capabilities of the new, more complex, products that we are offering.

(3) Requirements Analysis is identification of the EC system that will meet the previously defined business needs. As an example a business need may be to keep customers informed of ever changing products availability, costs, and terms. The requirement to meet this need might be a Web based catalogue linked to a data base on prices and availability; and set in a new organization where a single group maintains a common data base for the Sales and Purchasing Departments. Requirements analysis can be seen as a "wish list", or as an envelope of EC system functioning within which solutions can meet business need. In the real world it is impractical to build systems that will meet *all* requirements. On the other hand it is impossible to build a system that will meet *any* requirements unless those requirements are clearly articulated.

(4) Design is an activity which sets out the specifics of system. Questions to be resolved at this stage include:

- What will the system do?
- What is the system's design?
- Who are my potential vendors?
- By when do I need different parts of the system up and running?
- What tasks need to be done, and by when, to get the system implemented?
- What will the system cost?
- How will the system be integrated into other existing systems?
- What people have to be involved in the process, and for how much time?
- What are the needs for training?
- What teams need to be formed to implement the system?
- What organizational changes are needed to take advantage of the system?

(5) Implementation. The purpose of the implementation phase is to acquire and implement the system. This is the phase when new technology comes in the door, training is conducted, reporting relationships change, and new EC processes begin to function. Making this work involves careful management of activities and resources to move from the previously developed "paper-based" plans to the reality of implementing new systems in a company that at the same time is trying to satisfy its customers and respond to ever changing business conditions.

(6) Integration and Validation Testing makes sure that the system performs in accordance with its specifications. In other words, that it does what it is supposed to do and does not do what it is not supposed to do. First, individual modules are tested in isolation. Then integration testing begins as modules are hooked together. Finally the entire system is tested with the participation of the users. At this point the system may be put into service, but testing can be said to continue for a few months to assure that users are able to accept the system as a tool to assist in their routine work.

(7) Maintenance, the last phase of the project life cycle, is what happens to the system after it has become operational. It includes changes to the hardware, software, and procedures for using the system. This phase includes keeping the system going, adapting it to unforeseen circumstances, and planning for the evolution to new systems to meet changing business needs and the potential offered by new technology.