Market Assessment
Study of New Media
Learning Materials

IC

Volume 1 – Summary

Sponsor
Industry Canada

With the support of
Human Resources Development
Canada

Consultants
Ekos Research Associates
Hara Associates
Stahmer and Associates
Strathmere Associates International
The Halifax Group

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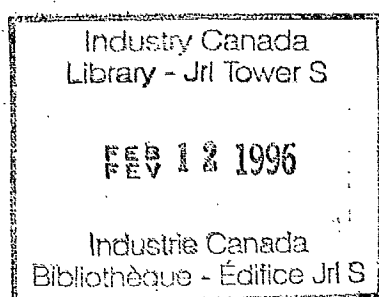Human Resources Development
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Executive Summary

> Canada can be known for knowledge and learning,
> just as the Swiss are known for banking and finance.

This study assesses the potential market for new media learning materials (NMLM) from both the supply and demand perspectives. The objective is to forge new market linkages between industry users and Canadian NMLM developers and suppliers *and in so doing to introduce creative solutions to the employment and learning needs of industry.*

New media learning materials consist of computer software and courseware content, including multimedia and interactive programs, applied to computer-based training. The spread of NMLM follows the increase in desktop computing power, sophisticated presentation software, CD-ROM technology and broadband networks.

The study responds to the global urgency to implement continuous and lifelong learning solutions in the face of rapid and persistent technological change, unemployment and global competition. In the transition to a knowledge-based economy, the prosperity of Canada and other industrialized nations rests increasingly on the ability of their labour forces to adapt to changing skill and knowledge requirements — *the effectiveness of corporate training is a key component of economic health.*

The countries that will prosper in the transition to a knowledge and learning-based society must establish policy, strategy and infrastructure to encourage and support continuous and lifelong learning at the individual, community and institutional levels. As Canada progresses in implementing its broadband information and communications infrastructure, such as the Information Highway, *the opportunity now exists to assert similar leadership in the development of technology-based learning content, or NMLM.*

The study is based on original baseline research. High-growth sectors were identified, and 18 industrial sectors and employment categories, representing 2.8 million new jobs or 64 percent of new job growth to the year 2005, were analyzed. Business case frameworks to govern corporate adoption of NMLM were defined, and an economic model was developed to project NMLM benefits at firm, industry and national levels. International market opportunities were identified, and the Canadian NMLM industry was profiled.

The findings are significant:

- For the sectors addressed, training is a priority, regardless of industry size and structure. However, the cost of training is a major concern. The focus of training is increasingly upon generic, cross-industry requirements, such as management skills, and compliance and

mandated training. Lack of technological infrastructure and awareness of NMLM benefits continue to be barriers to adoption.

- Canadian organizations using NMLM are reporting time savings of up to 75 percent over conventional training methods. They also report that the time taken for novice employees to achieve master performance has been reduced by 50 percent. *The use of NMLM can clearly provide industry with a significant competitive advantage.*

- For the sectors under study, annual savings of $223 per employee were forecast by the year 2005 through the use of NMLM — translating into an increase in labour productivity of 0.5 percent from the application of only one technology. *This represents annual savings to the Canadian economy of $2 billion, and this reduction in labour cost could create 9500 additional jobs* up to the year 2005.

- International training requirements reflect those of Canadian industry. Multimedia training solutions developed for Canada should have strong international markets, *particularly if Canada's strengths in software, telecommunications, distance education, cognitive science, creative production, and linguistic and cultural diversity are aggressively exploited.*

- Canada has a young but growing NMLM industry, with nearly 100 companies identified as producers of NMLM. The industry faces barriers that demand attention:

  - Despite critical industrial training requirements, there is limited awareness of NMLM and its benefits.
    Industry must be informed of the benefits of NMLM, and governments must become model users.

  - Despite parallel training needs and growing foreign markets, there are no substantive exports of NMLM.
    The Canadian NMLM industry must be promoted internationally.

  - Despite the strength of the business case, the economic benefits at the national level may not be realized without government leadership.
    Governments must aggressively promote industry adoption of NMLM, government use of NMLM and NMLM product development.

  - Despite growing demand and emerging supply, the Canadian NMLM industry is fragmented and fragile, with poor market linkages.
    Joint ventures, strategic alliances, multidisciplinary consortia and regional centres must be supported.

Canada has an enormous opportunity to seize the leadership in learning solutions, if the federal government acts now. The world recognizes Canadian strengths in software, telecommunications, distance education, cognitive science, creative production, cultural and linguistic diversity, and the ability to overcome time and distance challenges. With federal leadership, *Canada can be known for knowledge and learning, just as the Swiss are known for banking and finance — perhaps not the biggest, but the best.*

1. Introduction

1.1 Background

The Market Assessment Study of New Media Learning Materials was sponsored by the Information Technology Industry Branch of Industry Canada with the support of Human Resources Development Canada. The study was performed by a study team drawn from a consortium of companies consisting of Ekos Research Associates, Hara Associates, Stahmer and Associates, Strathmere Associates International, and The Halifax Group. The study team would like to acknowledge the close cooperation and valuable assistance provided by James Fulcher and Ezra Miller of the Information Technology Industry Branch of Industry Canada. The study team also acknowledges the valuable input provided by the suppliers and users who participated in the teleconference workshops.

The objectives of the study are threefold:

- to understand and assess the potential market for new media learning materials (NMLM) and in so doing to provide suppliers and users with better information on this market and to provide the federal government with advice on how it can help foster development of the NMLM industry

- to augment the knowledge base of the Canadian courseware industry and related capabilities, and in so doing

- to forge new linkages between the NMLM industry and high-growth industrial sectors.

The study is delivered in two volumes: Volume 1, which summarizes the findings and recommendations, and Volume 2, which presents the detailed research reports.

New media learning materials consist of computer software and courseware content, including multimedia and interactive programs, applied to computer-based training, intelligent computer-based training, intelligent tutoring systems, expert systems tools and other electronic-based training products. Most software is written to operate on microcomputers in either standalone mode or within networked environments.

The spread of NMLM follows the spread of desktop computing power throughout the workplace. Equally important is the increasing power of desktop computing to run advanced presentation software. In particular, the availability of CD-ROM drives is creating a wide market base to support stimulating and useful NMLM. This capability has only recently become widely available, making NMLM a young technology still in development.

The ability of a computer to interact with people allows individuals to work through modules at their own pace. Trainees may also undertake actual exercises, receive immediate feedback, and experience clips of audio and video examples. Reference layers (hypertext) can allow trainees to access greater levels of explanation when needed, including a live instructor as required (perhaps on-line in a remote city). Training can occur as needed without the need to organize a group class. NMLM can also complement group instruction. By addressing the main points of instruction, the computer programs free the instructor to answer questions and focus on individual trainee problems.

However, NMLM must not be regarded as a panacea, but as essential components of a growing integration of technologies to support learning. In the future, NMLM will be employed as the central part of integrated learning environments in which instructors, mentors, peers and facilitators will collaborate through technologies and resources, such as electronic conferencing, video conferencing, performance support systems, virtual reality and broadband communications technology (the Information Highway).

The study responds to many key driving forces acting on both Canadian and global societies. The world is rapidly moving toward an economy and society based on knowledge. Organizations around the world are rethinking their learning and training strategies in response to the enormous pressures they face in light of ever-increasing technological change, increased competition and global complexity. They increasingly understand that knowledge or know-how held within the organization and community, individually and collectively, is their most important competitive asset, and that survival at both the corporate and individual levels depends on the ability to continuously update knowledge and skills.

A new psychology is emerging that embraces continuous change and encourages inquisitiveness and innovation in support of a continuous reinvention process. This can be seen in governments at all levels and in successful corporations in all sectors. There is a growing understanding that learning is a shared responsibility between employers and employees as well as among government, industry and the education complex. Organizations are seeking new ways of capitalizing on their knowledge to become learning organizations. Individuals are realizing that lifelong employment is no longer assured, and that the emphasis is now on lifelong employability and lifelong learning.

The prosperity of the Canadian economy and other industrialized economies rests increasingly on the ability of the labour force to adapt to changing skill requirements. Rapid technological change creates ongoing demand for new skills in each industry. Globalized markets mean rapid shifts in demand between Canadian industry and service sectors, with a consequent demand for labour to shift into new occupations. Training is key to meeting these demands, both through ongoing training of employed workers and through training of the newly hired. Economies whose labour forces cannot adapt swiftly experience bottlenecks in

production as a result of skill shortages, structural unemployment among workers and reduced productivity among the employed.

The effectiveness of a nation's training industry is a key component of economic health. In addition, worldwide demand creates a valuable potential export market for the nation that can offer leadership in training and training materials.

The countries that will prosper in the transition to a knowledge and learning-based society must establish policies and strategies to encourage and support continuous and lifelong learning at the individual, community and institutional levels. This will be a complex process, involving the promotion of learning partnerships between governments, industry, schools, and colleges and universities, and the implementation of computer and communications technologies to support the citizen as a learner. Canada is making great strides in implementing its broadband information and communications infrastructure, the Information Highway, and our progress is leading the world. *The opportunity now exists to assert similar leadership in the development of technology-based learning content or NMLM.*

Indeed, in the urgency for creative new solutions to the unemployment crisis in the country, the Canadian NMLM industry has a significant role to play. Study findings show a potential 50 percent reduction in training costs as a result of NMLM use, and within the industrial sectors examined this can yield annual savings of $2 billion by the year 2005, with the resultant creation of some 9500 new jobs.

There is reason to be optimistic about the role Canada can assert in the NMLM industry internationally. The country enjoys many strengths that can directly assist the development of the industry and its projection into global markets.

- Canada has long been known as a knowledge-based country. In the 1950s and 1960s, Canadian engineering companies first established consulting leadership in international civil and energy projects.

- Canada is well respected in the field of education and has an international reputation in the area of distance education.

- Canadian academic researchers are world leaders in cognitive science and intelligent systems.

- Canada is a leader in the fields of telecommunications and software technology.

- Canadians understand the complexities associated with bilingualism, vast distances and multiple time zones.

- Canada is one of the most culturally diverse nations in the world. NMLM require cultural sensitivity — Canadians can customize products for any region of the world and can respond to the cultural requirements of NMLM.

- Canada has enormous learning needs itself, both in the development of new knowledge-based industries and in the mining of knowledge from within our traditional resource and manufacturing-based economy, sectors that are under extreme pressure in the face of global open trading.

- Canada has access to world markets enjoyed by few nations. The ease with which Canadians are welcomed internationally is a key asset and will be particularly important in education and learning fields where personal contact is so important.

- Canada is moving rapidly both nationally and regionally to put in place the infrastructure to support learning. The Information Highway, CANARIE Inc. and the progress of courseware firms in New Brunswick, Quebec, Ontario, Alberta and British Columbia are examples.

The challenges are formidable.

- The NMLM industry is young, dispersed and populated by small companies lacking the resources to fuel extensive growth.

- The implementation of the Information Highway will break down barriers to the delivery of learning material. Canadians will be able to access products from global sources, as is already occurring on the Internet and World Wide Web.

- The development and marketing of NMLM require a multitude of disciplines and resources — pedagogy and educational psychology, subject-matter knowledge, computer and communications technologists, creative design, production, business management and entrepreneurship, and distribution knowledge and access. This complicates the development of critical mass and requires significant capital whose access is difficult for an emerging industry.

- As yet, NMLM lack the structures and processes to link the demand side and the supply sides within the Canadian market.

- A federal strategy to support the NMLM industry is missing.

However, just as Switzerland is known for banking and finance, a similar opportunity exists for Canada to assert itself in knowledge and learning. Canada may never be the largest

player in the industries emerging around knowledge and learning, but it can assert itself as a major centre of excellence. Development of the NMLM industry will be key.

1.2 Study Steps

The study performed original baseline research organized in the following steps.

- Using government databases and statistical models, including the Canadian Occupational Projection System (COPS) model, the demand for training within Canadian industry was analyzed. In addition, the key industrial sectors and employment categories where job growth is forecast to occur over the next 10 years and where retraining for continuous upgrading and updating of skills are key training issues were identified. (Volume 2, Section 1, Ekos Research)

- Selected industry (user) representatives were interviewed to discuss training issues and to characterize the knowledge of and disposition toward the use of NMLM. The human resource sectoral councils established by Human Resources Development Canada to examine skills and training requirements in key industrial sectors were consulted. (Volume 2, Section 2, Ekos Research)

- Business case frameworks to support the sale of NMLM and to support the justification for their adoption were developed. (Volume 2, Section 3, Strathmere Associates)

- An economic model was developed to estimate the impact of the use of the technology on the industrial sectors identified and to extend the benefits to a national level. (Volume 2, Section 4, Hara Associates)

- An analysis of the export market potential (markets in the United States, Europe and to a lesser degree the rest of the world) was performed. (Volume 2, Section 5, The Halifax Group, Stahmer Associates)

- A survey was conducted to identify and understand Canadian developers and suppliers of NMLM. (Volume 2, Section 6, Ekos Research)

- Recommendations have been developed to assist the federal government in formulating a role in support of the industry.

2. Summary of Findings

2.1 Canadian Occupational Projection System (COPS) Employment Demand Projections (Volume 2, Section 1)

The initial step in the study was to identify those Canadian industrial sectors and occupational categories that are projected to experience job growth over the next 10 years. The intention was to assist Canadian NMLM companies in targeting their markets.

The Canadian Occupational Projection System (COPS) model, maintained by Human Resources Development Canada, was used to make projections of expected employment demand by industry and occupation for Canada for the period from 1995 to 2005.

Tables generated to rank the top 40 occupations using the National Occupational Classification (NOC) indicate:

- absolute change in gross number of jobs expected to be created, based on estimated employment in 1995

- absolute and relative growth in gross number of jobs between 1995 and 2005

- absolute growth in net jobs between 1995 and 2005

- major industry concentration for these occupations in 1995.

These tables show a continuing shift of the employment structure toward the service sector, with the service sector accounting for 36 of the top 40 occupations. Also noteworthy is the fact that four of the top five occupations in terms of expected gross employment change have low to medium skill requirements (child care and home support, retail sales, clerical and general office, cleaners). However, 24 of the top 40 occupations are in the two highest skill areas, with seven of these being managerial occupations.

The tables also show expected employment demand by industry. Projected industry employment growth closely parallels the findings by occupation, with most of the expected employment demand being found in the service sector, accounting for 15 of the top 20 industries. The tables also show the major occupations making up each industry; this information was used to select the industries to be further evaluated as potential markets for NMLM.

Based on this input and on the expert input of the study team, the ranking of sectors with the largest employment changes as indicated by the COPS was modified. Some large-

growth sectors such as personal and household services, amusement and recreation, which are arguably not strategic in terms of overall economic growth and performance, were dropped. Other industries such as biotechnology and the environment sector, which are emerging as industrial sectors of international strategic importance but which are too young to be reflected in the COPS model, were added to the list for examination. Furthermore, certain occupations are also strategic by virtue of the enabling role they play across a wide range of industries. Examples include systems analysts and software professionals and engineers. In recognition of the important role these occupations play in industry growth and performance and because such technologically sophisticated occupations represent important potential users of NMLM, they were added to the study.

Eighteen industrial sectors and employment categories were selected for further study. They were:

- retail trade
- accommodation and food services
- finance, insurance and real estate
- education — in-service training of teachers
- medical and health services
- wholesale trade
- construction
- transportation and storage
- agriculture
- printing and publishing
- machinery manufacturing and metal products manufacturing
- electrical and electronic products manufacturing
- telecommunications equipment manufacturing
- software
- engineering
- biotechnology
- environment
- academic-based development/delivery of workplace training.

Collectively, these sectors represent 1.5 million new jobs in the period from 1995 to 2005 and a further 1.3 million new jobs during the period from 2000 to 2005. This is approximately 64 percent of new job creation over these periods.

2.2 Sectoral Analysis of the Application of NMLM to Meet Skill Shortages (Volume 2, Section 2)

In order to identify the market potential for NMLM in the selected sectors, interviews were conducted with members of each sector. The interview process proceeded in two phases.

First, a representative from each sector's human resource development council (one of several industry-led councils established by Human Resources Development Canada to examine sectoral skills and training requirements) was approached. In this person's absence, another appropriate sectoral association able to provide a broad overview of the sector was contacted. Second, interviews were conducted with company representatives in each sector.

The survey process focused on the following topics:

- business factors in the context of the industry
- current training profiles
- specific training practices
- training expenditures
- future skill requirements
- the role for NMLM.

Volume 2, Section 2 presents a detailed treatment of the findings, which can be summarized as follows:

- A key factor and threat affecting attitudes to and use of NMLM relate not so much to which industry sector is being examined, but rather to the technological sophistication of workers, trainers and managers in each industry. Highly educated, highly computer-literate workers who are employed in technology-intensive jobs show a great readiness to use NMLM. They are familiar with the technology and are comfortable using it to meet their training and information needs. Some industries represent rich markets for NMLM largely by virtue of the fact that they employ large percentages of such technologically sophisticated workers.

- At the same time, industry structure does play a mitigating role. The biotechnology industry, for example, is technology-intensive, but it is as yet too small and fragmented to provide a large enough market base to support the development of NMLM that specializes in its needs.

- Most industries cite the need for management skills training and computer-skills training. These represent two highly generic market areas, since they cut across all industries.

- With growing competition and increasing foreign market orientation, there is a large demand for training that increases knowledge about foreign markets and trade promotion skills.

- Training needs relating to health and safety represent another set of requirements that are common to a number of industries. This kind of training usually involves large numbers of workers, first, because it is legally required in that it represents compliance or mandated

training in most jurisdictions and, second, because it is usually provided to workers in a wide range of occupational groups within any given establishment.

- Training needs relative to changing regulatory requirements were also cited by a large number of industries. However, these tend to be quite industry-specific. Suppliers of NMLM could specialize in the regulatory field but would have to tailor their products to specific industries.

- Some industries that could represent large *potential* markets for NMLM lack the technological sophistication. Put simply, they lag in the use of computer-based technologies generally and so lack both the equipment and familiarity with computer-based technologies. When these sectors cite cost factors as a barrier to the use of NMLM, they include the upfront costs of automating, as well as investment in courseware.

- Again, in the less technologically sophisticated industries, there is a widespread lack of awareness of just what NMLM comprise and how NMLM could deliver training. There is therefore a need for educating/informing potential users of NMLM and perhaps a need for demonstration projects.

- There is widespread concern about the costs of training in general. More specifically, training is very costly, primarily because of the downtime that results when employees are off the job. In this respect, the flexibility that NMLM offers would be very attractive to many companies.

- The flexibility offered by NMLM is also attractive in some sectors such as the environment industry, engineering and agriculture, where work is often performed at many sites or in remote areas. Having access to training/skills upgrading tools on-site is much cheaper and more efficient than transporting employees to distant training sites.

- The self-directed nature of NMLM is attractive to professionals such as medical professionals, engineers and perhaps teachers. Such groups do not respond well to traditional, top-down orders to learn material that is identified by management as being important.

- There is much concern over the fact that there currently appears to be no way to judge the quality of the courseware (content) that is produced. Because of this uncertainty, there is a tendency to rely on traditional training approaches.

The following table provides a sector-by-sector summary.

Summary and Assessment of the Market Potential of NMLM

Sector	Key Pressures	Skill Needs	Potential for NMLM	Perceived Advantages of NMLM	Perceived Obstacles to Use of NMLM
1. Retail Trade	• Growing competition • Technological change	• Management skills • Computer skills • Technical skills (e.g. work with data) • Customer service	Low	• Flexibility	• Lack of technological sophistication • Awareness • Lack of a training culture
2. Health Services	• Technological change • Fiscal restraint • Increasing regulation and litigation	• Skills to assist in controlling the self-directed learning process • Management skills • Communication skills • Counselling skills • Technical skills/medical information • Training for community-based delivery of some health services, home support	Very high	• Flexibility • Self-directed • Fast access to information	• Insufficient software/content to meet current demand
3a. Accommodation	• Growing competition • Increased regulation • Technological change	• Service orientation • Flexibility • Computer skills • Health and safety • Managerial skills	Medium	• Increases in efficiency, productivity, and profitability	• Training costs
3b. Food	• Growing competition • Increased regulation • Payroll taxes	• Professional skills • Computer skills • Personal skills • Basic skills • Food-specific culinary skills	Low	• Flexibility	• Lack of hardware
4. Education — Teachers	• Changing society • Changing expectations of schools • Cultural diversity • Mainstreaming of special-needs children • Fiscal restraint	• Conflict resolution and mediation skills • Use of technology in teaching • Subject-specific knowledge/upgrading	Low in the short term, medium in the longer term	• Ability to connect teachers	• Lack of user-friendly technology • Seen as a tool that could displace teachers • Age of teachers • Attitudes
5. Banking	• Technological change • Product/service diversification	• Professional skills • Technical skills	Very high	• Delivery of training as needed by employees — embedded training • Flexibility • Effectiveness	• Need to have compatible hardware in all branches • Acceptance by employees • Need for more and better NMLM

Sector	Key Pressures	Skill Needs	Potential for NMLM	Perceived Advantages of NMLM	Perceived Obstacles to Use of NMLM
6. Logistics	• Technological change, e.g. JIT • Growing competition	• Computer skills • Integrating skills • Management skills • Diagnostics • Supply-chain management • Leadership • Ethics	High	• Complementarity with needed skill base • Complementarity with traditional training approaches, e.g. games, scenarios	• The fact that the profession is spread across a number of industries and so, little critical mass in any individual company
7. Construction	• Costs • Technological change	• Diagnostics • Health and safety	Medium	• Accessibility • Reviewability	• Lack of software/content • Awareness • Three quarters of industry consists of small firms • Question of certifiable training
8a. Agriculture	• Growing competition • Foreign market orientation • Technological change • Changes in products/services	• Business management • Skills in maintenance and operations • Machinery operation • Technical skills • Computer skills	High	• Improved management skills	• Accessibility • Cost
8b. Horticulture	• Foreign market orientation • Growing competition • Technological change • Increased regulation	• Technical skills • Management skills • Marketing/exporting skills • Computer skills • Health and safety	Currently, medium but with higher potential in the future	• Control over what is taught/consistency	• Narrow range of software available • The fact that the industry is widely distributed, many in rural areas • Unfamiliarity with technology
9. Machinery/Metal Products/Electrical and Electronic Products/ Telecommunications Equipment	• Growing competition • Foreign market orientation • Technological change	• Computer skills, software • Human skills: working in teams, problem solving, decision making, communication • Technical skills • Information skills • Health and safety	Very high	• Complementarity with existing skill base • Savings on training costs • Consistency in content and delivery	• Upfront costs of purchasing computer systems • Lack of awareness
10. Printing and publishing	• Technological change • Changes in products/services	• Technical, computer skills, including marketing, interpersonal, and print production skills • Management skills • Customer relations • Quality • Sales/marketing skills	High	• Complementarity with existing skill base • Lack of accessibility of formal courses	• Lack of technological sophistication in (small) parts of the sector

Sector	Key Pressures	Skill Needs	Potential for NMLM	Perceived Advantages of NMLM	Perceived Obstacles to Use of NMLM
11. Trucking	• Growing regulation • Technological change • Growing competition	• Computer skills • Personal management skills (e.g. time management) • Interpersonal/communications skills • Basic skills	Low	• Complementarity with new technologies, e.g. on-board computers, but only a small proportion of companies has these	• Lack of technological sophistication • Perceived cost • Lack of a training culture/heavy reliance on hands-on training
12. Environment Industries	• Regulatory environment • Technological change	• Management skills • Technical skills • Technology skills • Export skills	Very high	• Complementarity with existing skill base • Flexibility • Accessibility	• Need for courseware that meets accreditation standards
13. Software professionals	• Technological change • Shortage of skilled workers • Upgrading of mid-career professionals	• Technical skills • Software skills	Very high	• Speed of delivery • Complementarity with existing skills base	• Need for hands-on training • Complacency of employers re up-grading skills of software professionals
14. Biotechnology	• Emergence of the industry from emerging status to commercialized industry • Regulation • Technological change	• Management skills, accounting • Marketing skills, especially in export markets, trade promotion	Low at present, the longer-term potential is high	• Complementarity with existing skill base	• Fragmentation of the sector
15. Engineering	• High attrition rates (engineers leaving the profession) • Maintenance of professional competence and technical skills	• Technical skills • Project management skills • Computer skills • Knowledge of export markets • Human resource management skills	Low	• Flexibility/accessibility • Self-directed training delivered as needed	• Fragmentation across sub-disciplines • Development costs of NMLM in context of relatively small numbers • Need for certification

From this analysis, a number of sectors represent significant potential markets for NMLM at the present time. This is largely due to factors such as technological sophistication, technological literacy of workers, greater acceptance of self-directed learning, a maturing knowledge of NMLM, the size of the industrial work force and the extent of technological change.

The study ranks the following sectors from highest to lowest potential, with a sample of the factors used in making the assessment.

- Health Services
  - high rate of technological literacy among large proportions of workers in the industry
  - rapid and ongoing technological change requiring skills upgrading
  - widespread recognition of the value of training among both workers and employers
  - fiscal restraint leading to heavier reliance on community support services, with attendant training needs.

- Banking
  - large in terms of the absolute number of workers in the industry
  - a sector accounting for a significant share of expected job creation in the 1995–2000 and 2000–2005 periods
  - rapid and ongoing changes in products and services, which require constant skills/knowledge upgrading
  - an organizational culture in which training is deeply embedded.

- Environmental Industries
  - large potential growth in terms of export markets
  - technologically sophisticated work force
  - rapid and ongoing changes in regulatory requirements and technology, necessitating skills/knowledge upgrading.

- Printing and Publishing
  - despite the small number of workers, expectations are for strong performance with respect to expected job creation in the 1995–2000 and 2000–2005 periods
  - rapid and ongoing changes in technology and in products and services, necessitating skill upgrading.

- Electrical, Electronic combining Telecommunications
  - very technologically sophisticated industry
  - high commitment to training in large segments of the industry
  - major drawbacks: the relatively small numbers of employees, and the relatively weak prospects for job creation, especially in the 2000–2005 period.

- Software/Computer Professionals
  - strong complementarity between workers' skills and NMLM
  - large current training/skills upgrading needs.

- Agriculture
  - high attrition (due to retirement/deaths) leading to high replacement needs, especially in the 1995–2000 period
  - more technologically literate farm operators and workers than in the previous generation, partly through their exposure to computer-based technologies in the school system.

- Construction
  - large industry in terms of employee numbers with moderate growth prospects
  - significant training needs with respect to technological change (e.g. new materials) and health and safety
  - major drawbacks: a relative lack of computer literacy among large proportions of workers in the industry, and the lack of a well-developed training culture.

Contrasted to these sectors are those that have both large absolute numbers of employees and large expectations for employment growth yet are still considered to have a low potential for NMLM at present. Accommodation, food and retail sectors are representative of this group; they employ large numbers of relatively unskilled workers with unsophisticated training needs, and they tend to be low-wage industries with limited career potential and a corresponding lack of incentive to pursue much in the way of training. However, in the case of retail, where high job growth is projected, the industry is undergoing technological change; there is a re-engineering trend focused on customer service, and NMLM may be the only way training requirements can be met in the medium term.

2.3 Business Case Frameworks (Volume 2, Section 3)

The major problem facing any new technology or product is the creation of awareness and justification for its use. While early adopters will assume greater risk, a sustaining market must be convinced that a new technology is effective, that it works, that it is efficient and that it represents the best use of resources.

This is a particularly sensitive issue as it pertains to NMLM, in so far as industry awareness is at an early stage and NMLM suppliers generally lack the formal analytic justification tools and sufficient empirical or analytical evidence.

Recent industry research consistently supports overall time savings in excess of 30 percent through the use of NMLM, while Canadian industrial users have reported training

cost savings with considerably higher retention rates. *In short, NMLM training is more effective and costs less.*

Benefit/Cost

The research describes a framework for benefit/cost and return on investment analysis. However, it stresses that while a *pro forma* approach can be used, individual factors must be weighted on a case-by-case basis. It also recognizes that the equation will change significantly as the supply of off-the-shelf products grows, in so far as NMLM adoption is still constrained by the high cost of custom development.

Research and experience demonstrate that benefits are achieved both in financial terms and quality terms.

- **Reduced Learning Time** — On average, learning time can be reduced in excess of 30 percent, with some users claiming up to *75 percent training time reductions in best cases.* NMLM technology is reported by industrial users to reduce the time required to train a novice to master-level performance *by 50 percent.*

- **Reduced Costs** — Delivery costs per student are reduced. Representative categories for savings include instructor costs, student travel and living, student salary (due to reduced training times), facilities and materials.

- **Instructional Consistency** — NMLM delivery is independent of the instructor and has no *bad days.* If the courseware has adaptive components, special needs of students are treated in a consistent manner. This tends to increase training reliability.

- **Privacy** — NMLM technology is non-judgmental. The user/NMLM relationship is independent of instructor, user or peer reactions and pressures. In many situations, the confidentiality of the learning experience leads to increased participation, inquisitiveness and risk-taking. This has been a significant observation in mixed gender and mixed cultural situations.

- **Effectiveness and Mastery of Learning** — Studies have shown that, although they depend upon such quality factors as design and content, both knowledge and performance improve through the use of NMLM.

- **Content Retention** — Where studies have been performed, a significant increase in retention has been observed. There are also significant improvements in recovery times to reacquire or reinforce previously learned material. This is particularly true in self-paced environments.

- **Increased Safety** — Simulation, including emerging uses of virtual reality technology, replaces exposure to dangerous or expensive situations. This is particularly true of applications in the transportation (aircraft simulators), nuclear and electronics industries.

- **Motivation** — Studies report improved learner motivation. This appears to be based on the degree of control available to the student, the opportunity to receive continuous personal feedback, and the strong relationship between the new media technologies and entertainment.

- **Access** — The use of NMLM dramatically improves the access to learning resources. This allows equal access to learning among new classes of workers — those who are geographically dispersed or those who have timing/shift/equipment access limitations.

- **Learner Enjoyment** — The use of NMLM tends to create a completely new attitude toward learning. Learning becomes enjoyable, and this leads to greater acceptance of responsibility for learning and an increase in inquisitiveness.

- **Timeliness** — The cost-effective maintenance of up-to-date learning material has been a constant problem. The computer-based nature of NMLM permits easier updating and modification of content.

While the benefits are compelling, the business case does not ignore the significance of the investment required to develop NMLM and to establish initial facilities to support a delivery environment. The following cost elements require evaluation for NMLM versus conventional approaches:

- **Cost of Development** — including salaries, creative design, programming/production, travel, physical infrastructure, computing resources and training trainers.

- **Cost of Delivery** — including student travel, student salaries, trainer costs, administrative overhead, space, equipment (rental or purchase), training material distribution, and training material maintenance and updating.

Section 3 of Volume 2 provides a detailed treatment of the benefit and cost factors and presents a representative evaluation worksheet.

Return on Investment

The research also recommends the use of a simplified multilevel approach to the calculation of return on investment. It is based on identifying, prioritizing and quantifying benefits of NMLM at three levels, as shown in the following table.

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1) Cost Reduction by Decrease in Expenses — easiest to quantify

- Reduced training expenses by decreased delivery costs (human resources, equipment, travel/living, time)
- Reduced outside contractor services
- Provision of more cost-effective employee ratios (e.g. more employees per supervisor) by having NMLM provide some tutoring traditionally done by supervisors.

2) Cost Reduction by Increased Productivity — harder to quantify

- Reduced learning curve, so employees reach full productivity sooner
- Reduced duplication of work, so employees spend less time completing a task, whether this is producing a product, making a repair or handling a customer enquiry
- Increased speed of service, so employees handle a higher volume
- Increased safety, reducing time lost and compensation.

3) Revenue Gain — hardest to quantify

- Increased sales through better prospecting, increased efficiency during the sales process and higher closing ratios
- Increased quality of service, leading to fewer cancelled sales, better customer retention and increased referrals.

The development of flexible and credible business case and return on investment analyses for NMLM will be key factors in the adoption of the technology by industrial users and will be important tools in the creation of clients for the NMLM industry. It will be essential to the growth of the NMLM industry to develop directories of examples of the application of these analyses, supported by case studies related to specific industry sectors.

2.4 Economic Benefits (Volume 2, Section 4)

While the business case frameworks focus on developing justifications for the use of NMLM in specific applications or corporate settings, the collective use of NMLM will have a significant economic benefit at the corporate, sectoral and national levels.

The research concentrated on developing models to estimate economic benefits as grouped in three categories:

- reduced training costs through savings in employee time as well as direct costs, in terms of both current training and broader use of training

- improved productivity, including increased productivity of the newly hired and increased productivity of all employees

- increased employment, through reduction in the cost of labour.

The benefits were estimated for the selected industrial sectors and employment categories to the year 2005, using the following steps:

- **Construct model.** The benefits of NMLM were broken down into specific types. For each type, a model was constructed, analyzing the benefit according to a simple function of the key determining variables. Each model was constructed so that the input values either were available or could be estimated within a reasonable confidence interval (high and low range for a given probability) by industry experts. To guard against utopian estimates, models expressed benefits as a percentage of current baseline values, such as current costs of training. Use of baseline values ensured that benefits estimates were anchored in an appropriate order of magnitude.

- **Obtain input values.** Where possible, current numbers were developed. The project team derived training cost estimates from recent surveys by Statistics Canada and the Conference Board of Canada. A special survey was conducted on training in the selected industries. To estimate industry reaction to lower training costs (implicitly lowering the cost of labour), a special run was commissioned of the Conference Board of Canada medium-term forecasting model of the Canadian economy.

  Where hard data sources were lacking, training industry experts with cross-industry experience were consulted individually and were asked to specify best estimates ranging from a low value they were 90 percent sure would be exceeded to a high value they thought there was only a 10 percent probability of exceeding. The industry experts had the benefit of the project team research, and were informed that their estimates would later be subject to peer review.

- **Develop initial estimates.** Based on the 10/90 percent confidence intervals, probability distributions were assigned to each input value. Multiple random trials of the models were conducted by computer, generating a probability distribution of the net benefits of NMLM. From these probability distributions, initial estimates of net benefits were derived. As with the input values, net benefit estimates were made in terms of a best estimate (mean) as well as a high and low value between which the true benefits were 80 percent likely to fall.

- **Conduct peer review.** The models and initial estimates were then subjected to peer review. The panel was made up of the individual experts who had provided initial values, plus others familiar with NMLM and training. The model structure was reviewed and modified to capture the appropriate impacts, and input values and confidence intervals were also reviewed and modified.

- **Develop final estimates.** Based on the peer review, input values and model structure were modified, and final results generated.

    The findings are significant.

- **Training costs and employment impacts.** In terms of formal training costs alone, NMLM will generate significant savings for the Canadian economy. For the sectors under study, annual savings are expected to increase to $1.6–2.5 billion by 2005, with a best estimate of $2.0 billion. On a per-employee basis, this represents savings of between $178 and $270 annually, with a best estimate of $223.

    This lower cost of training is a significant contribution to Canadian labour productivity growth. The best estimate, $2.0 billion annually, translates into an increase in labour productivity of 0.5 percent over the next 10 years. If labour productivity grows by an average of 2 percent annually overall, NMLM will likely contribute a little under one-fortieth of productivity growth for this period. In terms of the contribution of a single technology, this is a large number.

    The analysis also shows NMLM to be an employment-friendly technology. The lower training costs lower the cost of labour to the employer, lowering supply prices for labour and increasing output and employment. Unlike technologies leading to more capital-intensive production, this expansion in output is not offset by substitution of labour with capital on the part of employers. By lowering the cost of labour to the employer (independent of labour income), NMLM encourage more labour-intensive production.

    The magnitude of the employment impact was estimated at between 7400 and 11 700 additional jobs by the year 2005, with a best estimate of 9500 jobs. As a percentage of employment in the 14 sectors under study, the best estimate of 9500 jobs represents one tenth of one percent of total employment. Although this percentage may seem small, it is important to note that it is being applied to a very large number — the work force as a whole.

    In addition, the analysis suggests that this employment gain will come in the form of reduction in structural unemployment, independent of short-run economic cycles. To get a better sense of scale, a *permanent* increase of 9500 jobs would represent a reduction of between 2 and 3 percent of structural unemployment (which currently runs between 3 and

5 percent of the total labour force). This is a large contribution for a single technology. Ten similar contributions would cut Canadian structural unemployment by one third.

- **Benefit from faster learning curve by the newly hired.** In addition to reduced costs of formal training, NMLM are also expected to shorten the time required for newly hired employees to become fully productive. They will be able to start their training individually, without waiting for enough other trainees to form a class, and to retain material more effectively with NMLM-based training.

  While insufficient data were available for a formal estimate, sensitivity tests indicate that the order of magnitude will be roughly in the tens of millions dollars annually by the year 2005 for the sectors under study. This amounts to some hundreds of dollars in improved productivity for each newly hired worker. For example, if a newly hired worker begins working at 50 percent of the productivity of an experienced worker and if NMLM can shorten the learning period by two weeks, the best estimate of economic benefit is $100 per newly hired worker in 2005.

  Although the size of this benefit is much smaller than the annual gain from reduced training costs, the economic benefit is still noteworthy in absolute terms.

- **Benefits from integration of training into the work force.** A final source of benefit, although not necessarily the smallest, is the impact of changed training practices on on-the-job Canadian labour productivity. NMLM is expected to permit greater integration of training into the workplace. Access to just-in-time training through computer-based learning materials is expected to alter the way employees work as well as the way the workplace is organized.

  There are insufficient data to estimate this benefit or to conduct sensitivity analyses. While training culture is beginning to use NMLM within the context of current training practice, new practices that take full advantage of these tools are still taking form.

  Despite the lack of data, this source of gain should not be overlooked. Gains from changed practices may be as great as the estimated savings generated within current practice.

- **Conservatism of estimates.** Estimates were generated under conservative assumptions and methodology. Total estimates were aggregated from a detailed model of each sector under study. The estimates explicitly recognized and quantified risk using a Monte Carlo and modified Delphi estimation process. High and low estimates represented an 80 percentage point confidence interval (i.e. the low estimate has a 90 percent chance of being exceeded). Where formal survey data were absent, input values and risk assessments for

each sector were subject to peer review by an expert panel. Initial estimates were further validated by teleconference consultation with users and suppliers of NMLM.

In addition, several measures were taken to restrict the scope of benefits being considered to those that could be reasonably quantified:

- **General productivity impacts were excluded.** Productivity impacts resulting from incorporation of NMLM into the workplace (outside formal training) were not included.

- **Employment impacts were not valued.** Although impact on employment was estimated in terms of number of jobs, no attempt was made to value impacts on unemployment.

- **Cost reductions were based on savings on formal training only.** Implicit cost reductions from the improved productivity of newly hired workers or general productivity gains were excluded. Thus the model was based on an understated increase in the demand for training and workers.

There are several implications for policy. The estimates indicate that NMLM will generate significant economic benefits for Canada over the next decade. They also show there may be room for increasing those benefits. The baseline estimates incorporate current trends on the rate of adoption of NMLM training and on the rate of technical improvement of NMLM products. In 2005, firms incorporating NMLM into their training programs are expected to account for between 21 and 53 percent of employees, with a best estimate of 37 percent. This leaves a substantial number of employers not fully benefiting from the technology. Benefits to the Canadian economy may be increased to the extent that government policy can accelerate adoption rates or accelerate technical development of NMLM training.

2.5 Potential Export Market (Volume 2, Section 5)

The transition to a knowledge-based economy is a global phenomenon, and effective training is a factor important to all national economies. Common standards in microcomputing and the growing accessibility of communications networks as software delivery vehicles create international market opportunities for successful software products almost instantly.

While the Canadian NMLM market has significant requirements, it is insufficient to support the type of growth that companies must achieve to assert significance within a product line. Canadian NMLM companies must therefore develop international market strategies to complement domestic market development.

The access to international markets that communications technology enables cuts both ways: if the Canadian NMLM industry is not aggressive, then Canadian industry will be readily able to satisfy its training technology requirements from foreign sources instead.

Significant investment in the NMLM industry is occurring in the U.S. and has been ongoing in Europe for several years.

In order to guide international opportunities, markets in the U.S., Europe and, to a lesser extent, the rest of the world were reviewed.

2.5.1 The United States

Using U.S. Bureau of Labor Statistics (BLS) data, a strong correlation with the Canadian findings was observed. These can be summarized as follows:

- There is a strong shift of employment into the service sector, with the following BLS occupations experiencing the greatest numerical and percentage growth and resulting in the largest occupational groups: service occupations, professional specialties, technicians, administrative support and managerial.

- The highest growth appears to fall in the general categories of: health and care services, computing, education and retail.

- There is growing attention placed on developing generic skills. Skills experiencing increasing emphasis include: management, basic computer, communications, supervisory, customer relations, adaptation to change, basic literacy and numeracy.

- Despite this, occupation-specific training still dominates the type of training provided to employees.

Corporate training expenditures for 1994 were estimated at $50 billion. Of this, close to $4 billion was for external purchases of learning/training materials, and NMLM purchases presumably represent a significant portion.

Corporate training budgets remain stable, while training requirements are increasing. This suggests a shift to more cost-effective methods and points to increasing use of NMLM.

Corporate purchases of multimedia platforms are estimated at $1.3 billion in 1995, declining to less than $500 million in 1999; this trend suggests that the install base is rapidly being satisfied. Multimedia platforms are prerequisites for NMLM, and thus the U.S. appears to have a more mature computing infrastructure than Canada, where multimedia platforms and CD-ROM drives are still at an early stage of implementation in industry.

Forty-three percent of U.S. companies claim to be using computer-based training technology. The dominant use is teaching basic computer skills.

Many companies are restructuring their training departments into profit centres and are becoming competitors in the education and training marketplace. This is often in joint venture with their courseware suppliers.

Significant numbers of American NMLM suppliers are already focusing on the key sectors identified in Canada. While they constitute a competitive threat, they also represent opportunities to form U.S./Canadian joint ventures and alliances to tackle specific industry markets.

2.5.2 Europe

There has been significant investment in Europe to support the development and adoption of flexible and distance learning technologies including NMLM, as defined in this study. Significant programs focused on learning technology have been a major feature of the European Union's Framework Programs to support research and development over the past 10 years. The principal program is DELTA, which focuses on technological advances in distance education and learning.

Canada, unique among non-European countries, has established a working relationship with the European Union under the framework of the EU-Canada Forum for Distance Education. This forum has encouraged the share of information among the European participants in the DELTA program and Canadian distance education and NMLM companies. The Forum has also sponsored a number of joint research projects under a co-financing agreement.

Within the DELTA program, the BEACON project performed market observatory research. Market research in Europe has not identified industrial sectors or skill shortages, as this project has done for Canada. The significant national economic differences among European countries makes this difficult to do at a consolidated EU level. The BEACON project has estimated market size at national levels and has probed attitudes toward the use of technology to support education, training and learning.

The European market size for NMLM was estimated at $1.2 billion in 1994, a figure that is expected to experience consistent but modest growth through to the end of the century.

Volume 2 Section 5 provides data on national market sizes and disposition toward NMLM. The data suggest that training bodies in most European countries anticipate an increase in the use of NMLM, with Denmark, the Netherlands and Finland being most bullish. Belgium, Germany, France and the U.K. are less enthusiastic, which likely reflects early adoption disappointment.

Data describing key training domains and potential markets have been largely derived from the views of the NMLM industry in a manner similar to the expression of market views developed from Canadian NMLM suppliers in this study.

European market potential for NMLM *as expressed by European NMLM suppliers* is summarized in the following table.

Training Domain	Market Potential
General education	High
Basic office skills	High
Communication and personal development	High
Management skills	High
Basic computer skills	High
Marketing and sales	Medium
Information technology	Medium
Languages	Medium
Industrial techniques	Medium
Office automation	Medium
Finance, accounting and banking	Medium
Human resources	Medium
Trades and crafts	Low
Administration and secretarial	Low
Law and international business	Low
Purchasing, logistics and transport	Low
Medicine, health and care	Low

The low ranking of medicine, health and care contradicts observations of the Canadian and American markets.

However, there appears to be a continuing high ranking of generic business skills, which is consistent with the Canadian and American market findings. This is understandable, based on the current emphasis within industry on the development of a flexible, adaptable work force and the belief among NMLM suppliers that these are the subject areas where

multiple product sales will occur. Where purchase decisions are made by employees as individuals, it is also most likely that these topics will be priorities, supporting a general trend in the industrialized world toward the development of basic skills that support employability as opposed to specialization skills.

As in Canada, the European research also observes the weakness of NMLM producers in terms of business volume and number of employees. This presumably suggests a good potential for alliances, although partners should be selected carefully.

In contemplating the European market, Canadian companies should note that, despite the steady integration occurring in Europe, national differences continue to be very strong.

Countries that are obvious potential markets for Canadian NMLM suppliers are the U.K., France, the Netherlands and Scandinavia, where language is not a problem and where a strong Canadian affinity exists.

Markets that are receiving European development investment attention to improve economic conditions to the levels found in the U.K., France and Germany include Portugal, Greece and Ireland. These markets are often overlooked and could prove to be attractive niches, particularly for Canadian NMLM suppliers with language capability or national relationships.

Eastern Europe is also the focus of significant infrastructure development attention and a market in which generic skills training is a priority. Partnerships with western European firms can be an advantage in approaching these markets.

European investment in the exploitation of NMLM continues as part of an emphasis both on modernizing the European training infrastructure and on developing new cultural industries. Through a number of incentive programs, European investment appears to be in the range of $4 billion over the next four years to support multimedia education and cultural projects.

With this activity and with the collaborative agreements existing between Europe and Canada, there is significant opportunity for Canadian international business development.

2.5.3 Rest of the World

The following general observations apply to the potential of markets in the rest of the world for Canadian NMLM.

There will be strong universal markets for generic skills NMLM (e.g. basic computer skills, management), and North American suppliers and sources are favoured. Major issues

continue to be installed technology base, distribution methods, after-sales support, language and cultural differences.

Industry-specific NMLM will benefit from marketing partnerships or product coupling with Canadian industry or with companies already supplying international markets.

While developing nations have critical and largely unserved training requirements, technology infrastructure and financing are critical barriers. Marketing efforts should be directed at international organizations and financial institutions such as the Canadian International Development Agency, the World Bank and other regional development banks.

The following table provides a summary of national observations, showing specific country indications of either significant industry sector emphasis or a significant technology install base.

Hong Kong, South Korea, Malaysia, Singapore, Thailand	Key employment sectors: manufacturing, wholesale/retail, restaurants/hotels, finance, government services, personal services
Argentina	Banking/insurance, government services
Australia	$84 million allocated to multimedia enterprise of which $57 million is for NMLM; major training reform program; community services, health, construction, wholesale/retail, public administration; many partnerships with Canada
Brazil	Growing economy and install base
Bulgaria and Eastern Europe	Basic managerial skills stimulated by privatization, environment
China	Technical skills, management, accounting, marketing
Indonesia	Banking and finance
Japan	Growing home use of computers, promotion of computers in schools
Mexico, Chile, NAFTA	Government services, environment
Morocco	Largest African computer market
India, Pakistan	Government services, para-government organizations
Philippines	Emphasis on performance improvement in government and industry
Singapore	"Intelligent Island" program to link homes, offices, factories and schools; finance, health, transportation, construction, tourism, manufacturing, wholesale/retail
Taiwan	In middle of 10-year program to increase computer install base
Turkey	Banking, government services
Vietnam	Government services, significant Canadian development emphasis, long-term Canadian contracts to assist in developing government infrastructure, particularly information technology and environment

2.6 Canadian NMLM Industry (Volume 2, Section 6)

2.6.1 Characterization of the Canadian NMLM Industry

To develop an understanding of the Canadian NMLM industry, a supplier survey was conducted, and a series of teleconference workshops to validate the survey findings was held with representative firms in the Atlantic, Quebec, Ontario and western regions of the country. A teleconference with representative industry users of NMLM was also held.

Working with a collection of lists and directories for the software and multimedia industries, 95 companies were identified as producers of NMLM in Canada. Of these, 37 (or 39 percent) responded to the survey questionnaire, and 20 firms participated in the teleconference workshops.

Growth

- The NMLM industry is an emerging industry in Canada. It is built on the technological sophistication of its owners, managers and workers, and is at the leading edge of incorporating learning content with computer-based modes of delivery. It is a young industry — almost two thirds of the respondents to the survey of NMLM suppliers were established in 1985 or later, and 22 percent were established in the 1990s.

- Most companies are small in terms of both employment and sales. But the industry has been growing strongly. Sales and employment related directly to NMLM are expected to continue to expand, and the percentage of total company sales derived from NMLM products has increased to the point where, in 1995, more than 50 percent of company sales consisted of NMLM for the first time.

- Most NMLM companies are independently held, and most rely on retained earnings, generally derived from consulting services or non-NMLM products, as a source of financing. This heavy dependence on retained earnings for financing must be a constraint on growth for companies producing NMLM. Access to capital ranks high as an obstacle to growth and is the major obstacle to the development of packaged products.

- For most suppliers in this industry, NMLM represents only a portion of their total business. On average, less than one third of total employment in companies supplying NMLM is involved in the development and production of NMLM. Over the course of their lifetimes, these companies have seen significant increases in the share of employment that consists of educational professionals, software specialists and sales and marketing staff. Specialists hired on contract supplement in-house resources and provide special skills on an as-needed basis. Strategic alliances/joint ventures are also used by a majority of companies (69 percent) to acquire complementary skills and services.

- Growth of the industry can be a considerable contributor to job growth in Canada, and it is estimated that the industry can sustain a contribution in the range of 300 to 500 new jobs annually.

Management

- Strategic alliances and joint ventures were emphasized as major components of both development and marketing strategies. Workshop participants stressed the need to engage the film, entertainment and print media industries in the development and distribution process. They were also concerned over the high overheads associated with the management of alliances and joint ventures; they suggested that representative business models be developed to govern different partnership models and that mechanisms to protect the interests of smaller companies are needed. Resulting product ownership was seen as a problem inhibiting joint venture development.

- The industry has been built on its technical capabilities, its strength in R&D and skilled labour — these are its lifeblood. Nevertheless, it also saw its management skills, marketing capabilities and access to capital as also having been of significant importance. Neither government assistance nor the cost of capital were considered to have played important roles in the growth of the industry to the present.

- Over the next three years, respondents expect management and marketing skills to play increasingly important roles in company growth. Related to this is the growing importance to the industry of strategic alliances and joint ventures, and the continued critical importance of R&D/innovation capabilities, skilled labour and technical capabilities. Together, all of these factors contribute to the building of critical mass, both within companies and on a local/regional basis.

Product

- Off-the-shelf courseware is the predominant type of courseware produced (generating 61 percent of sales, on average). Custom courseware developed exclusively for a client's application ranks second (45 percent of sales), followed by intelligent tutoring systems (38 percent of sales), and customized courseware (25 percent). Embedded performance support and authoring tools and training shells rank last (at 18 percent and 9 percent of sales, respectively). The bulk of computer-based training products are interactive with text and graphics or with text, graphics and full-motion video.

- Most products currently are delivered on diskette (68 percent), with close to half being delivered on CD-ROM or CD-i. It is interesting to note in this regard, however, that the great majority of companies also plan to develop applications for distribution by computer network and by cable, telephone or satellite in the near future, with CD-ROM continuing

to rank high. The teleconference workshops emphasized the belief that delivery over broadband networks would be the predominant method. This raises issues of network interoperability, intellectual property protection and billing methods.

Standards

- Standards were not seen as a major issue. Teleconference participants agreed that delivery platform standards are more or less in place; however, network interoperability remains an issue. NMLM suppliers consistently stressed the need for reference accounts and testbeds over the need for compliance standards. ISO 9000 compliance at the development and management levels was recognized as increasing in importance and essential for significant European market penetration.

Markets

- The Canadian NMLM industry's focus has been on the Canadian market. The most significant source of competition in the Canadian market arises from U.S.-based producers of NMLM. This concentration of sales in the Canadian market is unique for an information technology-based industry. This can be explained in part in terms of the localization of products — NMLM written for and used by individuals and firms/organizations in the Canadian market are not likely to be exported, at least not initially. But the domestic focus also reflects the youthfulness and small size of most of the companies in the industry. This again raises the issue of critical mass. Through continued strong growth and the judicious cultivation of strategic partnerships and a focus on high-volume product areas, such as core competency and compliance training, the industry should soon be in a position to expand its presence internationally. In fact, many of the Canadian NMLM producers do export to a variety of countries now. A key goal must be to raise their profile both at home and abroad and to increase the volume of sales that are made in export markets.

- The manufacturing sector and government have been the predominant sectors targeted for NMLM products, with transportation and utilities and health services ranking second. Some shift in focus is expected over the next three years, however. The percentage of NMLM companies planning to develop products for the health services industry is expected to increase, manufacturing will remain important, and government and transportation and utilities are expected to decrease in importance. At the same time, the percentages of NMLM suppliers planning to develop products for the education and resource sectors and the telecommunication industry are expected to show strong increases. Smaller but still notable increases are expected for construction and accommodation and food.

- Overall, these trends are complementary to the conclusions reached concerning the domestic market potential for NMLM.

- While most respondents to the NMLM supplier survey reported having a formal business or strategic plan, fewer than one third conduct formal market research. By far the predominant marketing strategy used by NMLM companies to the present has consisted of word of mouth and referrals. Trade shows and conferences have also been important, followed by retailers/distributors and magazine reviews. Generally, companies have found these marketing strategies to be quite effective, though two other approaches — advertising in newsletters and cold calls/visits — ranked higher in effectiveness than in relative importance as marketing strategies.

- Yet, it would seem that word-of-mouth/referrals are weak marketing strategies as they pertain to custom projects and are relatively ineffective for volume products. The predominance of this approach might be a reflection of the relative youth of the industry and the fact that the NMLM market is not well developed. It would nevertheless seem that this represents a key strategic issue for the industry, particularly as it tries to expand domestically and, equally important, in export markets.

Future Growth

- Obstacles to company growth tend to fall into one of two groups. The first group consists of those that represent significant obstacles. Two of these — technological sophistication of potential customers and awareness/understanding of computer-based training tools — are closely related and are consistent with the conclusions reached in the earlier demand-side study referred to above. They are also consistent with the fact that this is an emerging, technologically sophisticated industry.

- Basically, NMLM suppliers are at the leading edge of current computer technology and are far in advance of the general public. High proportions of potential users in other industries are still in the early stages of incorporating computer-based technologies into their operations; many are intimidated by sophisticated technologies. Furthermore, many still do not invest a great deal in training. NMLM suppliers therefore face the dual challenge of converting potential users to the bottom-line benefits of both training in general and NMLM products more specifically.

- Also ranked relatively high as obstacles to growth are access to capital, the companies' own marketing skills and access to distribution channels. Again, the latter two are consistent with respondents' assessments of their own weaknesses and are reflected in plans to strengthen the marketing function in the next few years. Of lesser importance as obstacles to growth are cost of products/services, availability of skilled workers, management skills, and availability of information about domestic and foreign markets.

- In the teleconferences, access to capital was stressed as a major issue, particularly by the larger companies, who were more advanced in their development. The high cost of mass

marketing was emphasized, and it was suggested that a while a product/subject might require $1 million to develop, it requires $2 million to support the marketing effort.

Role of Government

- Although few companies saw government as having played an important role in the growth of the industry *to the present*, the majority of respondents (76 percent) did see a role for government in facilitating growth of the NMLM industry domestically. Respondents made several suggestions in this regard. These focused on tax incentives and funding, government procurement, "buy Canadian" programs directed at NMLM users, education programs to bring Canadian industry up to speed on computer-based technology and the use of NMLM for training, and the provision of market information to the NMLM industry.

- On this question, companies stressed the importance of government programs to encourage the use of Canadian NMLM products, including government's use of these products to address its own training needs. Currently, the federal government is a huge consumer of training, much of it informatics-related. This represents a potentially large market for NMLM, one that could benefit from the potentially substantial savings that use of NMLM could provide. Use of Canadian NMLM to address training needs in government could also provide a significant testbed for new training technologies and approaches and could represent a rich source of demonstration projects and best-practice approaches to training for other Canadian industries.

- Several suggestions were also made regarding the role for government in facilitating growth of the industry internationally. These focused on programs to promote the Canadian NMLM industry abroad, promotion through international conferences and trade shows, funding and tax incentives, and the provision of market information.

2.6.2 Canadian NMLM Industry Strengths and Competitiveness

- While young and still maturing, the Canadian NMLM industry is growing rapidly and already has produced several companies of significant size (more than 50 employees). There is reason to suggest the industry enjoys characteristics that will contribute to continued growth and sustained competitiveness.

- Canadian NMLM suppliers enjoy significant technical capability and operate at the junction of the software domain, where Canada has significant strength and an international reputation, the multimedia domain, which is rapidly growing, and the education domain, where Canada has a considerable reputation, particularly in the field of distance education.

- With 100 companies operating in the industry, the necessary critical mass is developing. This is particularly true of the Montreal and southern Ontario centres. In areas where there is less concentration — New Brunswick, Alberta and British Columbia — there is growing regional attention to networking and cooperation.

- NMLM growth and competitiveness will require the participation of film, entertainment and print media companies. Canada has a strong creative base, largely centred where the highest concentrations of NMLM suppliers exist.

- Joint ventures and strategic alliances will be important elements in the development and marketing of Canadian NMLM. The majority of Canadian NMLM suppliers are already operating in some form of alliance and are applying a priority to the creation of cooperative arrangements. The recently announced TeleLearning Canadian Network of Centres of Excellence should assist in building these partnerships.

- Canadian NMLM suppliers have a high degree of focus on the development of products to serve generic learning needs (computer, management, office, health and safety). This is where both domestic and international demand is forecast.

- Canada has good international performance in many of the sectors that have been identified as having high potential for significant adoption of NMLM. Examples are banking, environment, telecommunications, software and computing. A concentration on these sectors not only should lead to early sales, but also should be more easily leveraged into international sales.

- Canadian NMLM suppliers enjoy a rapidly growing broadband communications network environment. This facilitates cooperation among geographically dispersed participants and leads to the creation of virtual critical mass. It also supports the early transition to network delivery of learning products and significantly reduces the cost of international market access and product delivery.

- Canadian bilingualism and linguistic diversity are significant assets in the delivery of products to international markets.

- In a similar vein, Canada's rich cultural diversity can be used as a key competitive advantage in the cultural translation of learning products for diverse international regions.

2.6.3 Barriers to Growth of the Canadian NMLM Industry

- While the industry is growing, it is still populated by small companies without the resources to aggressively capitalize on the perceived opportunities. The global demand for

learning technology is not privileged Canadian knowledge and other nations, particularly the U.S. and Europe, are investing heavily in the industry.

- The development of NMLM products, particularly for high-volume sales situations, is expensive, and the history of access to capital for applications development in Canada is dismal.

- The need for multidisciplinary development efforts poses a severe challenge to companies located outside the major metropolitan centres.

- While there is an enormous requirement for training within Canadian industry, the national record in training investment by the private sector is poor, and the general awareness of the benefits — and even the existence — of NMLM is low.

- Canadian NMLM suppliers report a continuing reluctance to buy Canadian, often within government itself.

- While the implementation of the Information Highway offers significant advantages for Canadian NMLM companies, it also offers a freeway down which competing products can flow into Canadian markets.

- Growth of Canadian NMLM companies is at a critical point where the inventor/owner/manager model will have to yield to experienced business management. This is the time when many firms disappear.

- The multimedia and NMLM industries are already experiencing shortages of people who have creative multimedia design and development experience, who have educational technology experience and who have instructional design knowledge.

2.6.4 Emerging Canadian NMLM Opportunities

Growth Sectors — The New Economy

- Eighteen industrial sectors and occupations have been identified in which significant job growth is forecast and where training, new applications of skills and knowledge development are issues. These are summarized in this report and are detailed in Volume 2, Sections 1 and 2.

Of these, the following have been identified as having high potential for the application of NMLM:
- health services and care
- banking

- environmental industries
- printing and publishing
- telecommunications, electrical and electronics
- software and computer professionals
- agriculture
- construction.

Of these sectors, the following exhibit strong international markets:
- health services and care (particularly in the U.S.)
- banking (particularly in newly industrialized countries)
- environmental industries
- telecommunications
- software and computer professionals (globally).

● As models to leverage into international markets, telecommunications and environment are interesting. The telecommunications and environmental industries have extensive internal needs and also represent industries where Canada has a significant international market position and reputation. The telecommunications industry represents a significant market opportunity for Canadian NMLM suppliers, in terms of both meeting Canadian training requirements and leveraging the significant international market position Canadian telecommunications suppliers enjoy in the world. This suggests the potential to embed NMLM within the overall telecommunications product and service business offering and also to seek joint venture marketing alliances to introduce Canadian NMLM into Canadian telecommunications international situations.

Canadian environmental industries are developing international markets principally focused on consulting and engineering services, and impact assessment and mitigation. There is a significant international requirement for environmental education and training, and the Canadian government is a strong international proponent. Education is particularly acute as it pertains to NAFTA compliance (Mexico, Chile), eastern Europe and newly industrialized nations such as Vietnam, South Korea and Brazil, where environmental impacts are receiving increased attention. The environmental sector also represents a deep wealth of topics, from generic process management to specific industry impacts and specialized knowledge. Environment would appear to be an ideal sector for NMLM joint venturing.

Core Competencies — Generic Skills

● Observations of both Canadian sectors and international trends confirm a substantial emphasis within industry and government on basic competencies to support long-term employability. These competencies include computer skills, management skills, communication skills and adapting to change, in addition to generic business functions such as accounting, purchasing, personnel management, health and safety. These subject areas

represent significant market potential both domestically and internationally. This is a domain where Canadian language competency and cultural diversity is a unique asset in the development of common yet culturally translated products. Such titles are likely to be purchased by both large organizations and small and medium-sized enterprises as well as by individuals. They will therefore be attractive to the home market as well as for distribution through public networks.

Traditional Industries — The Old Economy

● While the focus has been on the sectors forecast to exhibit growth, Canada's traditional resource and manufacturing-based industries should not be ignored, from two perspectives.

Firstly, there is a considerable requirement to introduce new technology in mining, forestry and forest products to remain competitive. These industry sectors have extensive associated training requirements, and are easily reached through industry associations and research centres.

Secondly, while Canadian resources are threatened by the liberalization of global trade, the industrialization of new regions and the discovery of readily accessible resource deposits and forest stands, Canadian know-how in these sectors remains at the forefront. In the knowledge economy, new wealth can be generated by exploiting this knowledge and transforming knowledge into formalized products. Through this process, it can be Canadian knowledge that supports the development of trading partner industries through joint ventures and facilities management agreements. Education and training will be key components in building and maintaining these relationships, providing opportunities for Canadian NMLM suppliers.

3. Recommendations

Government Procurement

Recommendation 1

Government must become a model user of NMLM.

There is industry concern that governments at all levels are weak users of the technology that, in certain situations, are resistant to change. This is possibly motivated by fear of job loss.

Industry feels that increased use of Canadian NMLM will yield significant benefits:

- it will serve to create new products that potentially can serve broader markets

- it will provide a testbed for new techniques and approaches, increasing industry experience

- government testing and validation processes will provide a *de facto* informal certification process

- the use of Canadian NMLM by government will serve as a positive reference to support international marketing efforts.

The government significantly advanced the adoption of electronic data interchange (EDI) technology through the efforts of Revenue Canada and Canada Post Corporation. This type of leadership coming from Industry Canada and Human Resources Development Canada could significantly advance the Canadian NMLM industry.

Recommendation 2

Government should consider incentive programs to encourage government acquisition of Canadian NMLM.

While the industry appreciates all the help it may receive, it was outspoken in encouraging government to focus on the creation of customers and not content. Thus incentives should be directed toward encouraging the purchase of NMLM or the development of NMLM *as proposed by the industry*. The industry does not favour programs that would sidetrack scarce resources to service perceived government needs. The industry also cautions that content development is an expensive process and that a minimum figure of $500 000 should be reserved for the custom development of a product/subject.

The Treasury Board Secretariat should also be encouraged to develop a department-wide training policy to address the use of NMLM as a training option.

Recommendation 3

Government should consider establishing a Standing Offer for NMLM.

This will facilitate the procurement process and encourage multiple product sales. This is felt to be particularly important, as it pertains to NMLM products addressing generic training needs that are common to several or all departments. This would include topics such as basic computer skills, management skills, adaptation to change, etc.

Recommendation 4

Government should consider a formal policy to outsource training requirements to the private sector.

This is an approach being introduced in industry and has government precedent in other service areas.

Recommendation 5

Government should be less protective of content ownership.

Government must seek partnerships with Canadian NMLM companies to commercialize information, knowledge, expertise and training materials existing in departments. The government is frequently seen as a competitor of the industry.

Research and Development (R&D) Tax Credits

Recommendation 6

Government must protect research and development and technology tax incentives.

Canadian NMLM make extensive use of the R&D and technology tax credit regime to support product research. Industry members encourage government to interpret R&D tax incentives to cover the complex process of content development and production.

Industrial Adoption

Recommendation 7

Government must take an active role in informing key industries about Canadian NMLM.

Government should assist in providing forums where potential users can meet and be informed about Canadian NMLM. This suggests interventions at industry conferences, trade shows, association meetings, contributions to newsletters, etc. These can also include information services established on the Internet and World Wide Web. Particular attention should be paid to the banking and venture financing community.

Recommendation 8

Government should consider tax incentives to encourage industry to invest in training.

Tax incentives should be specifically designed to reward training and promote the use of NMLM in the private sector.

Critical Mass

Recommendation 9

Government should promote the creation of joint venture consortia to develop NMLM content.

Incentives should be designed to encourage collaboration between industrial users, NMLM developers, creative producers and distribution channel representatives.

Such collaborative initiatives should also be extended to marketing initiatives — the creation of a Team Canada for Learning.

Recommendation 10

Government should be encouraged to support the creation of regional competency clusters.

Support to the creation and strengthening of regional associations representing the multiple disciplines required to produce NMLM should be encouraged, with the objective of creating centres of critical mass. Initial centres could be located in New Brunswick, Quebec, Ontario, Alberta and British Columbia.

Recommendation 11

Government should commission the development of business models to govern joint ventures and strategic alliances.

Partnering strategies, and the implementation and management of cooperative vehicles, will be key to the continuing development, marketing and support of NMLM.

Recommendation 12

Government should commission studies to develop business models for the distribution of NMLM.

These models should address delivery from the individual custom level at one extreme to mass markets at the other extreme. Models should also be developed to address delivery through Information Highway networks, including issues of intellectual property protection and payment collection.

Marketing Support

Recommendation 13

Government should support the creation of a virtual clearing house for NMLM information.

This should likely take the form of a sophisticated Web site, which would, among other things, list Canadian NMLM companies and products, organize and publish best-practice case studies, provide multiple discipline resource data bases, support service inquiries. The site should also be equipped with electronic conferencing capability to support active interest group collaboration.

Recommendation 14

Government must ensure that Canadian foreign missions are informed of Canadian NMLM.

The industry lacks the resources to aggressively market internationally and is dependent on government assistance. This assistance should take the form of Canadian promotion, support for trade shows, market information and joint venture intelligence.

NMLM Industry

Recommendation 15

Canadian NMLM companies must be more strategic in their pursuit of markets.

Market emphasis should be placed on high-growth sectors and products to support high-volume applications, such as mandated and compliance training and core competency subjects.

4. Conclusions

Conclusion 1

Canadian industry, consistent with industry around the world, has significant training and learning needs. This is particularly true of the key sectors of the Canadian economy, which are forecast to be major locations of current and future job growth. Eighteen industrial sectors and occupational categories have been examined, which represent 2.8 million new jobs over the period from 1995 to 2005 and 64 percent of the projected job creation over the period.

However, within industry, there is limited awareness of NMLM and the benefits of use.

Conclusion 2

The industrial sectors projected to grow in Canada, notably related to a service and knowledge-based economy, are consistent with projections for other countries, particularly the United States.

The major areas of training and learning need within Canadian industry are consistent with requirements observed internationally. The development of learning solutions for Canadians should have application to international markets.

However, the Canadian NMLM industry has not yet developed a significant export market position.

Conclusion 3

The use of NMLM can result in significant improvements of efficiency (use of resources) and effectiveness (mastery of learning) over traditional training methods.

Efficiency benefits are obtained through the reduction in learning times of 30 to 75 percent as well as the reduction or elimination of direct training costs such as travel, per diems and learning materials. In addition, efficiencies can be obtained through better operations management by allowing trainees to learn at off-peak times.

NMLM has also been shown to increase mastery of learning through higher retention rates, increased time between retraining and its ability to disseminate more information for a given training period.

However, these significant economic benefits are not restricted to the use of Canadian NMLM, and will not be achieved without aggressive adoption encouragement.

Conclusion 4

The use of NMLM within Canadian industry can deliver significant overall benefits to the Canadian economy. The research suggests $2 billion in annual savings in training costs by the year 2005 — $233 savings per employee for the sectors under study. These savings represent a 0.5 percent improvement in labour productivity over the 10 years until 2005. In addition, the model suggests the lowering of training costs will result in 9500 *permanent* new jobs by 2005, which translates into a 3 percent reduction in the numbers of structurally unemployed Canadians. These figures are considered conservative and are based on a projected 37 percent of employees benefiting from NMLM. If government can accelerate adoption rates or accelerate the development of NMLM products, economic gains will be proportionately greater.

However, these significant economic benefits are not restricted to the use of Canadian *NMLM. Early and aggressive leadership in promoting adoption of NMLM would contribute to the development of Canadian NMLM production, with further potential economic benefits.*

Conclusion 5

Canada has a young, growing, but fragile NMLM industry, closely coupled to the multi-media, software and education industries. The industry suffers from a number of barriers to growth, including lack of capital, lack of user awareness of benefits, lack of distribution channels, lack of human resources in critical areas such as instructional design, lack of end-user infrastructure in multimedia, and lack of market intelligence for developers. This industry, if it leverages numerous Canadian characteristics into advantages, has the potential to serve Canadian needs, to develop significant international markets and to contribute substantially to job creation.

However, the industry has poor market linkages and will be subjected to intense competition.

Conclusion 6

While NMLM represents a creative new solution to address the persistent structural unem-ployment crisis and an opportunity to develop a new industry that will play a key role in the global, knowledge-based economy, the government lacks policies and strategies to promote the use of NMLM and to support the Canadian NMLM industry.

The government must leverage Canadian technology strengths, particularly as the NMLM industry can contribute to broader national social, employment and learning goals.

The government must show leadership in the adoption of NMLM, must aggressively support broader industrial adoption of NMLM and must establish programs to accelerate the growth of the Canadian NMLM industry.

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