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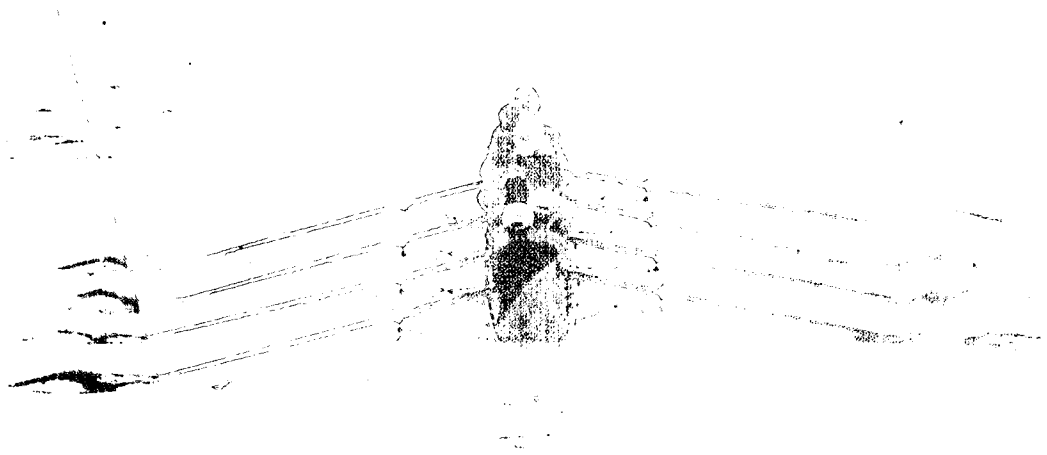
ABSTRACT

This report analyzes the role of the Task Force on Labour Market Issues of the Council of Ontario Universities in meeting industry skill needs, focusing particularly on three sectors: biotechnology, culture, and software/information technology. Also included are the findings of an earlier study on the skill needs and training requirements in the electrical/electronics and tourism/hospitality sectors. The report notes the following themes common to all sectors: (1) communication, cooperation, and learning skills gained from university education are valued in the workplace; (2) industry wants a practically oriented curriculum that will give students real world skills; (3) industry desires improved communication to facilitate greater input regarding evolving skill needs; (4) industry wants enrollments to respond more quickly to labor market needs; (5) employers value cooperative education and other work-based programs; (6) industry requires broader skills training, including skills once associated only with management positions; (7) training methods must be immediately relevant and delivered using flexible and accessible methods; and (8) employees must be exposed to the latest technological developments. The report concludes with recommendations for future actions and strategies to address the skills shortages identified. (Appendices contains members of the Task Force on Labour Market issues and sector representatives.) (MAB)



SECTORAL SKILL NEEDS:

THE ROLE OF UNIVERSITIES

COUNCIL OF ONTARIO UNIVERSITIES
CONSEIL DES UNIVERSITÉS DE L'ONTARIO

Prepared by the Task Force on Labour Market Issues

SECTORAL SKILL NEEDS

and

The Role of Universities

Task Force on Labour Market Issues
Office for Partnerships for Advanced Skills

Council of Ontario Universities
Ontario Ministry of Education and Training

March 1998

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Acknowledgements

This report was prepared by the Task Force on Labour Market Issues established by the Council of Ontario Universities. The Task Force membership (see Appendix 1) includes representatives of industry, universities, and government. All members of the Task Force contributed to the report and the recommendations. The particular contribution of Dr. Torben Drewes, Trent University, who was the main author, is gratefully acknowledged.

The Task Force met with representatives of three sectors; Biotechnology, the Cultural Industry, and the Software/Information Technology sector. The contribution of these representatives (see Appendix 2) constitutes a very significant contribution to the work of the Task Force and this report.

This report is another is a series or reports demonstrating the value of partnership between industry and universities, along with government. The cover picture reflects the strength of partnership found in initiatives such as this one.

Executive Summary

• The Task Force on Labour Market Issues, an initiative of the Council of Ontario Universities (COU), furthers the Council's work in bridging the gap between Ontario's universities and industry sectors.

• To better understand the role of universities in meeting industry skill needs, the Task Force conducted reviews of three sectors: Biotechnology, Culture, and Software/ Information Technology.

• This report combines the Task Force's findings with those contained in an earlier (1995) report by COU on skill needs and training requirements in the Electrical/ Electronics and Tourism and Hospitality sectors.

• Skill needs are categorized using the following:
  - the need for adequate flows of university graduates from programs related to sector needs,
  - the need for changes in university curricula,
  - the need for training in new skills for individuals already employed in the sectors,
  - the need for updating skills of individuals already employed in the sectors.

• The following common themes arise in all five sectors:

  • The broad-based education produced by universities continues to be valued in the workplace, both the technical skills and the foundational skills that allow graduates to communicate well, work with others and engage in lifelong learning.

  • Sectors also want a practical orientation included in university curricula so that graduates come equipped not only with a good command of their discipline of study but also with "real world" skills to apply in a workplace environment.

  • Sectors want a more active dialogue with universities that will allow them to provide input regarding their evolving skill needs. Employers currently have difficulty knowing how to approach the university "system."

  • Sectors want enrolments to respond more and more quickly to labour market needs. This is particularly true for sectors that are experiencing strong employment growth and that are restricted by a shortage of graduates in related fields.

  • Employers value co-operative education and other work-based programs that

allow them the opportunity to inject real industrial experience into students' academic careers.

• Sectors require a surprisingly wide range of skills training for their employees as changes in workplace organization place demands on individuals for skills once associated only with management positions.

• Training of employees must be of immediate relevance and delivered using methods that are flexible and accessible if it is to be useful to employers. Modularity, as opposed to traditional formats, is essential.

• Particularly in the area of advanced technical skills, it is essential that employees are regularly exposed to the latest technological developments. Universities are regarded as being the source for this exposure.

• The Task Force has concluded that much of what is required to better meet the skill needs of the sectors can be accomplished through better communication between these sectors and the universities. Universities also need the financial resources required to respond to these needs. The Task Force has therefore made the following recommendations:

Recommendation 1

The Council of Ontario Universities should work with interested parties in industry and government to develop a strategy to provide the financial resources universities need to address the critical skills shortages identified by sectors.

Recommendation 2a

The Office for Partnerships for Advanced Skills should initiate a series of symposia between the individual sectors reviewed in this report and interested universities.

Action on this recommendation should proceed immediately with a target date of early fall 1998 for the symposia.

Recommendation 2b

With leadership from the Council of Ontario Universities and the Office for Partnerships for Advanced Skills, Ontario universities should establish advisory groups that include industry

representatives to review professional needs for trans-disciplinary skills, such as entrepreneurship, marketing and financial skills, and methods of incorporating these skills into university curricula.

Recommendation 3

The Office for Partnerships for Advanced Skills should continue the process that began in 1993 by establishing a dialogue with additional sectoral skills councils and other sectoral organizations.

Recommendation 4

The Office for Partnerships for Advanced Skills should facilitate a symposium, originating in Ontario but including real or virtual links outside the province, to disseminate the information collected by this Task Force.

Recommendation 5

The Council of Ontario Universities must continue to be actively involved in ensuring the processes set out in the previous recommendations produce action plans that will address the sectors' advanced skill needs.

Introduction

Recent years have seen the emergence of a well-founded conviction that high level labour skills are critical to the future economic prosperity of society and the individual success of its members. There is, equally, a belief that current rates of skills acquisition are inadequate and that measures to support and encourage human capital investments are required.

Universities are naturally regarded as having an important role in this process, particularly in the creation of the critical advanced skills associated with the profound technological and workplace organization changes now taking place. Many recent human resource studies convey the distinct impression, however, that universities are not responding appropriately to the training needs of the labour market. Their program enrolments, it is argued, are out of proportion relative to the mix of skill sets required by employers; their curricula need updating; their methods of program delivery are designed for archetypical undergraduate students and not working individuals with little time for lengthy, fixed schedule courses; there is insufficient attention paid to the skills required in the "real world" of work; and they have made little progress in integrating their programs with those of the other important educators and trainers, such as colleges, to provide a seamless and coherent framework for advanced skills acquisition.

Through the Council of Ontario Universities, the province's 17 institutions have taken a number of steps to bridge the gap between industry and the universities. COU's Committee on the Universities' Collaborative Role in Training and Adjustment (CUCRITA) was established in 1993. With federal and provincial support, and the collaboration of two industry sectors, CUCRITA's mandate was to assess the requirements for advanced training across industrial sectors in Ontario, to determine the appropriate role for universities and to assist universities in playing that role effectively and efficiently.

One of CUCRITA's initiatives was a major study undertaken by Ernst & Young to understand the skill requirements and the need for advanced training in the Tourism and Hospitality sector and the Electrical/Electronic sectors in Ontario.[1] This comprehensive study provided important insights into the role that universities could play in supporting these sectors, prompted several initiatives (described below) to provide that support and laid the groundwork for this report.

Another CUCRITA outcome was the establishment in November 1995 of a new affiliate of the COU, the Office for Partnerships for Advanced Skills. OPAS is a partnership linking Ontario universities and industry sectors. It maximizes the ability to define

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1. Ernst & Young (1995), *Assessing Skill Requirements and Delivering Training to Meet Identified Needs*, Council of Ontario Universities.

industry's advanced training needs through this partnership and provides industry with a point of entry into Ontario's universities. Given the independent governance and missions of the universities, OPAS is an important vehicle for facilitating dialogue between the sectors and the university system as a whole, and for actively seeking to establish partnerships between sectors with advanced training needs and the universities with the programs and faculty to address these needs.

OPAS has already begun to respond to the sector needs identified in the cited 1995 report by developing modular training in identified areas. The *Modular Advanced Training Programs* consist of two certificate programs developed with industry and delivered by university faculty in a modular fashion. Each program consists of five modules of one or two days each and scheduled at intervals to minimize work disruption. The *Certificate Program in Business and Management Skills* focuses on the needs of technical experts who have been promoted into positions that require a broad understanding of business, a facility in understanding financial statements, budgets, marketing, communications and project management. The *Certificate Program in Leadership for Enhanced Performance* covers such issues as managing a modern, culturally diverse workforce, motivating and managing knowledge workers, and managing change. OPAS is also involved in graduate internship programs, co-operative education initiatives and the development of technology-mediated training for managers. Through satellite links and other means, its *Visionary Series* delivers seminars to the academic and business communities featuring industry leaders who share their visions of the future impact of technology on these industries.

In May 1997, COU established the Task Force on Labour Market Issues to build on its progress to date by extending its understanding of skill requirements and advanced training needs to additional sectors. With representatives from industry, government and universities, this Task Force selected three sectors for review: Biotechnology, Software/Information Technology and the Cultural Industry. Each of these sectors has critical advanced training needs involving universities and each has developed a sectoral skills council that articulates those needs and serves as a point of contact. Moreover, the three sectors display a diversity that spans the range of possible models of training delivery and partnership between universities and sectors. Lessons learned from these sectors, therefore, provide templates for other sectors.

The Task Force conducted a preliminary review of each industry and then consulted with representatives from the three respective sectors to assess training needs and the potential role of universities in fulfilling those needs.

Although the work of the Task Force continues, this report consolidates the work that has been done to date. It also summarizes the work of an earlier Task Force that reviewed the Electrical/Electronics and Hospitality and Tourism sectors. This provides an updated and single point of reference for the process that began in 1993 and serves as a platform for the next steps.

The human resource development needs within any sector are highly complex. The following report limits its examination of each sector to the aspects of the needs that are directly relevant to university-sector partnerships, thereby significantly reducing the scope of inquiry. Nevertheless, for clarity of the issues, a conceptual framework is provided before the specifics of each sector are discussed.

A Conceptual Framework

The skills intersection between universities and the sectors can occur at different junctures, and the issues may vary considerably depending on which point is being considered. Figure 1 presents a visual device for organizing the following discussion.

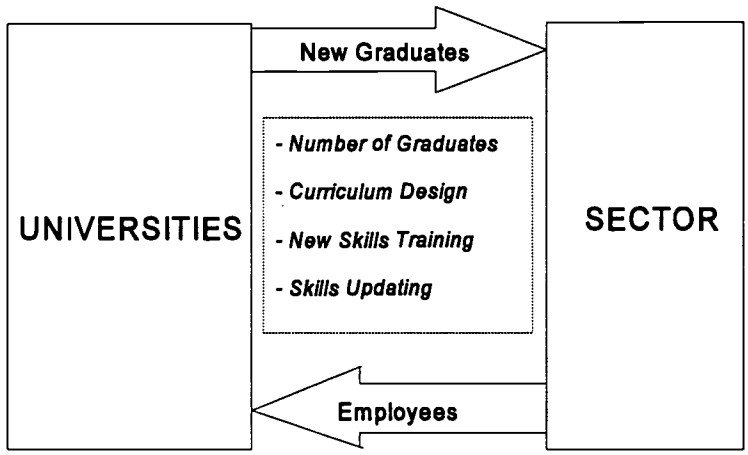

Figure 1

A sector is connected to the university system through flows of people. New graduates of the system appear as job applicants with degree in hand. The university system is a primary source of new employees in many occupations within any sector, and employers have a keen, bottom-line interest in the educational activity that has produced these graduates. Sectors also look to universities to supply educational opportunities for individuals already employed in the industry, as represented by the bottom arrow in Figure 1.

In this report, the many advanced skills issues arising in each of the five sectors are organized according to the following four part taxonomy:

1. *The Flow of Graduates*

   In some sectors, especially those exhibiting strong growth, the most pressing human resource need may simply be to increase the flow of new university graduates from related programs. This appears to be the case, for example, in the Software/Information Technology sector. Although the problem is simply stated, the issues here will be the most difficult to resolve. Enrolment patterns reflect choices made by students who often appear little influenced by labour market conditions as well as universities unwilling or unable to allocate resources to new programs or to reallocate them across existing programs. Although some successes have been achieved in improving the matching of programs and sector needs, employers often appear frustrated that more cannot be done even though universities can present credible arguments for a degree of separation between educational and labour market agendas.

2. *Curriculum Design*

   Although universities continue to be the source of choice for individuals with good foundational skills, weakened university infrastructures may result in graduates possessing outdated skills, particularly in the leading edge technology areas. A common theme emerging from sector reviews is that, even if students graduate with a superior academic training in their field of choice, this training has invariably forgotten a profoundly important point -- in the workplace, these students will apply their training in a business environment. This point surfaces in all five of the sectors reviewed in this report. Regardless of the sector's core activity, the employees, be they graduates of engineering, English or economics, will become involved in some way in the business of the enterprise. Employers' favourable attitude toward co-operative and internship programs is, in part, a product of their desire to inject this dimension into the educational experience of students.

3. *New Skills Training*

   A recurring theme in sector studies is the need to equip current employees with new skills. As they climb the ladder of the internal labour market, these employees take on new responsibilities and functions for which they are ill-prepared. Chemists become department heads and need to read budgets. Tool and die makers take on management functions and must learn team leadership skills, business communications and so on.

Universities excel at imparting the foundational and management skills that these upwardly mobile employees need. They are, however, not particularly adept at delivering this training to individuals already employed. The tool and die maker, for example, may not have the academic background required for admittance or, if she has, is not able to attend one hour lectures three different days a week for eight months. Executive MBA programs that concentrate the study period yet still require months of intensive work typify the universities' tendency to regard education/training as coming only in large, indivisible packages. The oft-repeated call by employers for modularity in program delivery summarizes the primary issue in new skills training.

Modularity improves accessibility. The need for greater use of prior learning assessment tools within the university system to help facilitate entry of individuals without the usual academic qualifications for admittance is also notable. By providing some credit for prior learning, these tools may also reduce the often discouraging length of time required for adults to complete degree requirements.

4. *Skills Updating*

For some occupations, particularly in the advanced technology sectors, skills quickly obsolesce and must be continually upgraded. Although much of such activity may take place in the workplace through professional associations and industry-based research activities, many employers in the sectors reviewed in this report find universities to be the most appropriate place for such skills updating. Like new skills training, employers want modular-based approaches that do not remove valuable employees from the workplace for extended periods of time.

In this section, the model in Figure 1 is used to help clarify discussions concerning each of the sectors. However, as with any model, this one carries the risk of oversimplification. In particular, by looking only at the relationship between the university system and the sectors, the model overlooks the importance of establishing linkages between universities and other educators. No coherent human resource strategy in any sector will involve universities to the exclusion of college and other training providers. Employers would be well served by an educational system that allows a smoother transfer of individuals between institutions, and that allows them to select from a co-ordinated menu of educational options from which employees can choose.

Sector Reviews

This section reviews advanced skill needs in five sectors: Electrical/Electronics, Tourism/ Hospitality, Biotechnology, Culture and Software/Information Technology. The discussion of the first two sectors is based on the 1995 report referenced above, which can be consulted for more detail. Analysis of the latter three industries draws on material gathered by the Task Force on Labour Market Issues and on its discussions with sector representatives (see Appendix B for a list of consultations).

While each sector is unique, there is a remarkable similarity in their skill needs. A desire to see new university graduates equipped with the skills needed to function well in the workplace, the need to provide their employees with management and leadership training and the great importance attached to modular program delivery are some of the recurring themes. These will be discussed in detail after the review of individual sectors.

Electrical/Electronics

The Electrical/Electronics sector employed 120,765 people Canada wide in 1991, with 71,325 in Ontario. Almost one-third are in the commercial and other electronic equipment industries, with an additional third employed in business machines and industrial equipment fabrication. The remainder are distributed across small and major appliances, and lighting. An occupational distribution in the sector is not available, but it is interesting to note that 12.4 percent of the Ontario work force in this sector has a university background at the bachelor's level, with an additional 4.6 percent qualified at the postgraduate level.

Table 1
Critical Success Factors in the Canadian Electrical/Electronics Industry

Factor	%
Technology Innovation	58%
Attract/Retain/Train Key People	51%
Product Quality	49%
Customer Service	44%
Capital Availability	36%
Organization Excellence	35%
Short Time to Market	33%
Protect Intellectual Property	18%
Access to Foreign Markets	12%
Influencing Industry Standards	8%
Supplier Relationships	7%

Source: Ernst & Young (1995), *Assessing Skill Requirements and Delivering Training to Meet Identified Skill Needs*, Council of Ontario Universities

The Electrical/Electronics sector takes human resource issues seriously. Table 1 reports the results of the Ernst & Young survey that asked employers about their views of various factors critical to their success. Despite the technical nature of the sector, human resources are a close second to technology innovation on the list. Moreover, the survey found that the next two critical factors, "improved product quality" and "customer service," depend largely on the quality of personnel in the industry.

The importance attached to product quality and customer service is reflected in the mix of skills reported as being in demand by employers in this sector. Although technical skills associated with leading-edge industrial technologies figure prominently as would be expected, there is a remarkably strong demand for generic and management skills, with almost three-quarters of survey respondents indicating a future demand for generic skills, 65 percent for managerial skills and 55 percent for technical skills. Skills such as listening and oral and written communication, and interpersonal skills are highly ranked, while the importance of innovation in the industry is reflected in the learning, creativity and innovation, problem-solving and analysis skills.

Supply of Graduates and Curriculum Issues

Increased capital intensity and productivity, new approaches to work organization and the recession of the early 1990s conspired to produce little recruiting in the early part of the decade. The Ontario employment base peaked in the late 1980s at approximately 106,000, falling to 70,000 in 1992. Although there was some recovery -- to 80,000 individuals by 1994 -- training of engineers, technicians and technologists at an advanced level appears to have been driven more by replacement needs than by growth in overall employment. Thus, the sector's recent history of recruitment provides no evidence of mismatch between program enrolments and industry needs.

Less than 50 percent of sector employers surveyed were satisfied with the generic, management or technical skills of the current employees. (Table 2 lists the specific components of each of these broad categories.) Recall, however, that only a minority of these employees are products of universities, and no evidence is provided that is specific to university graduates. A 1994 survey of industry CEOs[2] found a fairly consistent message: that the technical skills of these graduates are not lacking, but that there are problems with creativity, troubleshooting, interpersonal skills and communication. It also found a desire to be more directly involved in the educational activity, perhaps through co-operative education initiatives.

Thus, while the technical skills of recent graduates may be taken as a "given" by employers, new recruits will increasingly be expected to package such skills with broad generic and management skills, including communications, problem-solving and analysis, team development, change management and project management.

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2. Council of Ontario Universities (1994), *Human Resource Development Proposal.*

Table 2
Skill Categories

Category	Specific Skills
Generic	Listening, Planning & Organization, Analysis, Problem Solving, Conceptualizing, Creativity & Innovation, Leadership, Managing Conflict, Written Communication, Oral Communication, Time Management, Decision Making, Interpersonal, Learning
Management	International Business, Strategic Alliances, Quality Control & Process Improvement, Benchmarking, Purchasing Decision-making, Legislation: Pay/Employment Equity, World Class Manufacturing, Inventory Control, Financial Mgt., Human Resources Training, Program Mgt., Demand Flow/Process Mgt., Continuous Process Improvement, Team Development, Profitability, Change Mgt., Strategic Mgt., Project Mgt., Total Quality Mgt., Situational Leadership
Technical	Leading Edge Industrial Technologies, TPM/TQM, CAD, Continuous Flow Manufacturing, MRPII/KANBAN, LAN/WAN, Robotics, PLC, ISO, Materials Specification, Dynamic Modelling, Thermal Models, Statistical Process Control, Engineering Change Notices, Geometric Dimensioning, Thermal Analysis, Test Plan Procedures, Electrostatic Technology, Preventative Maintenance, Cellular Manufacturing

Source: Ernst & Young (1995), *Assessing Skill Requirements and Delivering Training to Meet Identified Skill Needs*, Council of Ontario Universities

Skills Training and Updating Issues

The human resource priorities of this sector appear to lie more in the training area than in the education process; less than 50 percent of employers were satisfied with the skill levels of current employees and forecasts of generic, management and technical skills requirements rose to 74 percent, 65 percent and 55 percent, respectively. Moreover, employers in the Electrical/Electronics sector were clear that universities would be increasingly appropriate sources of training in the future, particularly for generic and management training but also for technical training. Respondents rated university and college courses as the most effective training methods for all three categories of skills.

Figure 2, extracted from the Ernst & Young study, illustrates the potential role for universities in the training activities of this sector. For each major category of skills, the bars indicate the difference between the proportion of respondents reporting the use of each training source and the proportion of employers desiring to use that source. The large negative gaps for universities, particularly in the case of management and generic skills, indicates the significant degree to which universities are not involved in training, but ought to be, in the opinion of the employers. Bars for universities extending to the left of 0 percent represent opportunities for them to supply more training to the sector. Bars for any training source extending to the right of 0 percent indicate a risk that universities will be used to a lesser extent in the future.

Gap Between Current and Appropriate
Sources of Training

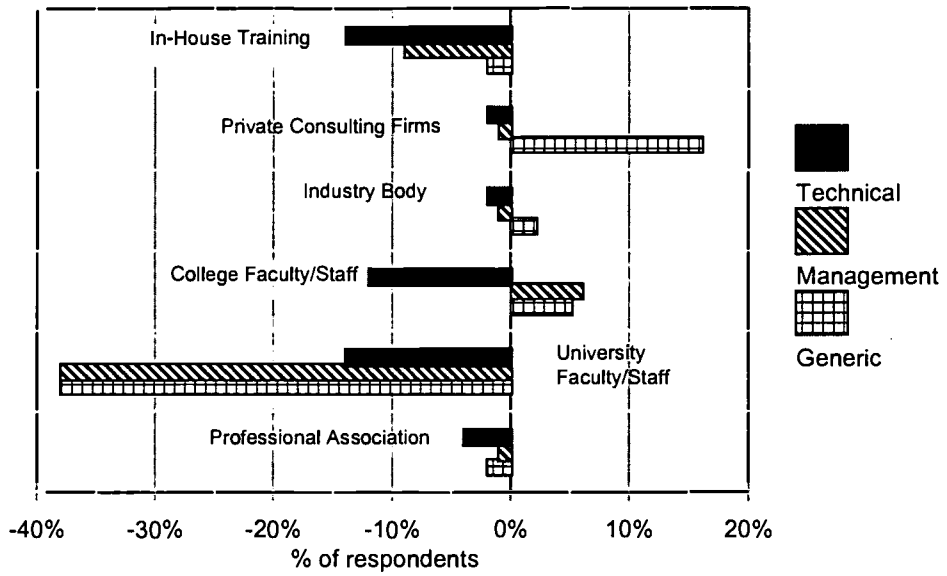

Figure 2

Source: Ernst & Young (1995), *Assessing Skill Requirements and Delivering Training to Meet Identified Skill Needs*, Council of Ontario Universities

Figure 2 indicates a significant opportunity for universities, but they will have to offer programs in a particular format if the training is to be useful to the sector. Employers were asked to indicate both their current use of training methods and the most appropriate methods. In the case of generic skills, modular university courses recorded a gap of approximately 31 percent, indicating a significant unfilled demand for this type of training method. The corresponding proportion for program-related university courses was only 9 percent. Corresponding values for management skills and technical training were:

Management skills:	Modular university courses	- 55%
	Program-related university courses	- 10%
Technical skills:	Modular university courses	- 60%
	Program-related university courses	- 13%.

While there is a deficiency in current levels of program-related university training available to the sector in all cases, the difference between the unfilled demand for modular and program-related courses is dramatic and telling.

In addition to equipping employees with skills to adapt to new functions, employers in the Electrical/Electronics sector must cope with an escalating rate of adoption of new processes and technologies that rapidly depreciates technical human capital. The President of the industry association remarked:[3]

> *"The half-life of specific technical training in our industry is now six to nine months."*

Once again, universities are regarded as the source of choice for such skills upgrading but employers need programs delivered in modular fashion that allows regular and consistent exposure to technological developments. Another quote from the Ernst & Young Study summarizes the attitudes of employers very well:

> *"The pace of change is so fast that our people often lose touch. We need regular briefing sessions on leading edge developments and we can't get them."*

Note the use of the term "briefing sessions," as opposed to courses.

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3. Quoted in Ernst & Young (1995), *Assessing Skill Requirements and Delivering Training to Meet Identified Skill Needs*, Council of Ontario Universities, p. 30.

Tourism and Hospitality

The Tourism and Hospitality sector is a major Ontario employer with an Ontario employment base of about 315,000 in 1991. The great majority (68 percent) of individuals are employed in the food services industry, with most of the remainder (14 percent of the total) working in hotels, motels and tourist courts. The remaining 18 percent are employed in sports and recreation clubs, taverns and bars, lodging houses, and other amusement and recreational services. The economic importance of the Tourism and Hospitality sector may be understated by the usual statistical accounting of employment, given the degree to which other sectors such as the transportation industry are influenced by it.

The Tourism and Hospitality sector has come to recognize the need for human resource strategies and displays an escalating commitment to training. The single most important success factor for the industry is the quality of customer service, which is seen to depend very much on the generic skills of the sector's workforce. Good communication and interpersonal skills are essential, for example. The sector also requires a cadre of competent managers and people who understand the business of Tourism and Hospitality. Table 3 indicates the specific skills within the three broad competencies investigated in the Ernst & Young survey.

Table 3
Skill Categories: Tourism/Hospitality

Category	Specific Skills
Generic	Computer Literacy, Service Delivery, Communications Skills, Problem Solving, Decision-Making, Leadership Education, Team Development, Learning
Management	Sales, Human Resources, Financial, Labour, Situational, Entrepreneurial, Environmental, Strategic, Change, Franchise, Profitability, Labour Legislation/mgt.
Knowledge of Business	Hospitality Culture, Tourism/Hospitality Marketing, Quality Control, Business Planning, International Business, Demand Flow/Process Mgt., Continuous Process Improvement, Strategic Alliances

Source: Ernst & Young (1995), *Assessing Skill Requirements and Delivering Training to Meet Identified Skill Needs*, Council of Ontario Universities

Employers and employee representatives are currently dissatisfied with the skill levels of their workforce. Only 33 percent of employers responding to the survey indicated satisfaction with the business knowledge of employees. Fewer respondents

(31 percent) expressed satisfaction with the generic skills in the workforce while managerial skills elicited the least favourable response with only 28 percent of employers satisfied. The sector's training needs are significant, with the majority of respondents expressing the need for an increase in the use of each of these skill groups: generic - 61 percent, management - 53 percent, business knowledge - 54 percent.

Supply of Graduates and Curriculum Issues

The Tourism and Hospitality sector's employment base in Canada is expected to grow at an annual rate of 3 percent between 1992 and 2005. At the same time, demographic changes will shrink the size of the pool from which the sector typically hires. According to 1991 census figures, 41 percent of the sector's employees are between the ages of 15 and 24, with fully 54 percent younger than age 30. Taken together, these two factors suggest a strong likelihood of looming recruitment difficulties in the sector. The Tourism and Hospitality industry is not, however, a heavy user of university graduates. Only 4.9 percent of the sector's Ontario workforce, concentrated in management positions, possess a university degree. While employers in the sector may express an increasing interest in hiring from universities, there is no strong evidence of a mismatch between industry needs and university-program enrolments.

Employers in the Tourism and Hospitality sector, like employers elsewhere, are looking for employees with skills that border on the attitudinal: initiative, problem-solving, decision-making and so on. A recent human resource study of the accommodation sub-sector, for example, found that an employee's attitude and previous work experience tend to carry more weight in a hiring decision than formal education or training, although the latter were viewed as advantageous for advancement.[4] While employers' expectations of university graduates may not be completely met, there is no evidence of a need to bring industry requirements to bear on curriculum design within universities.

Skills Training and Updating Issues

With a relatively low level of educational attainment in the sector's labour force and a general dissatisfaction with current skill levels, there will be a significant need for skills upgrading as the sector launches into a more serious development of its human resource strategies. Employers in the industry indicate a move away from the traditional on-the-job, in-house training programs toward a greater reliance on universities (and colleges) in their future training plans.

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4. Human Resources and Development Canada (1995), *Human Resources Study of the Canadian Accommodation Industry.*

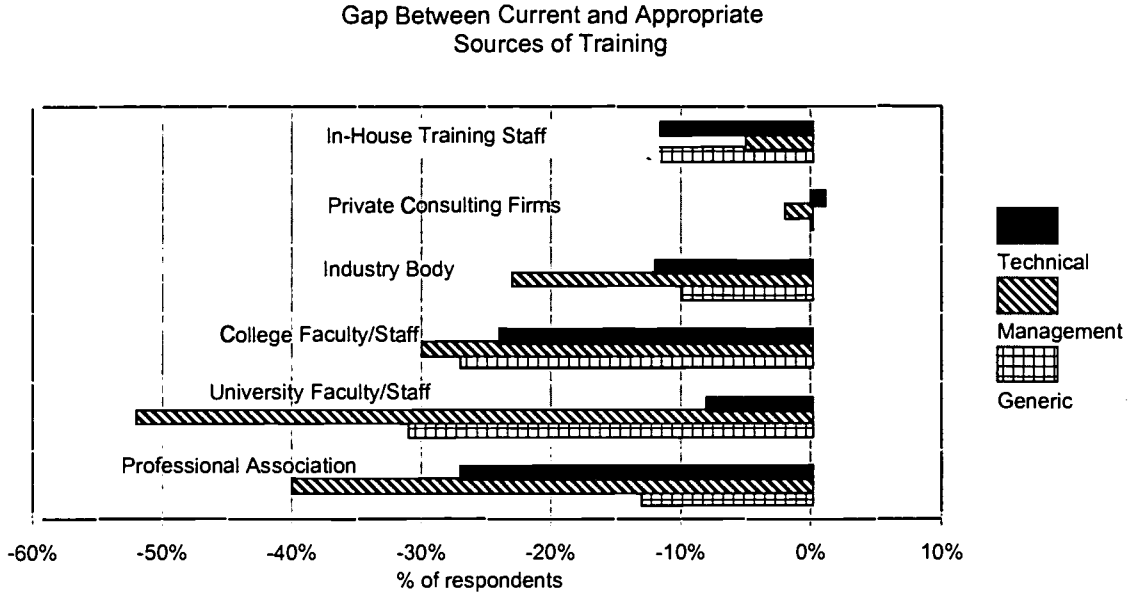

Figure 3

Source: Ernst & Young (1995), *Assessing Skill Requirements and Delivering Training to Meet Identified Skill Needs*, Council of Ontario Universities

Figure 3 quantifies the current gap between sources of training currently used and sources employers in the sector wish to use. For example, the value assigned to management training given by university faculty/staff indicates that 52 percent more respondents to the Ernst & Young survey believe that universities are seen to be a more appropriate source of such training than their current use would suggest. While the difference across training sources is not as dramatic as it is in Electrical/Electronics sector, it remains true that the gap (and therefore the opportunity) for training in generic and management skills is greatest for universities. In the case of training in the specifics of the tourism and hospitality industry, the sector intends to continue its reliance on college programs, professional associations and in-house training.

To fill the training gap indicated in Figure 3, universities will have to be aware of the peculiarities of the Tourism and Hospitality sector. The relatively low educational attainment of the workforce suggests that academic qualifications for entrance to university programs may act as a significant barrier to entry. As well, the sector is characterized by very high turnover rates -- average employee tenure in the industry runs as low as 40 months in some sub-sectors, compared to 130 months in the Electrical/Electronics sector. High turnover suppresses employers' appetites for lengthy, expensive training programs that enhance the trainee's value to competitors. It is especially likely, therefore, that this sector's employers will be unhappy with degree programs in universities that are not of immediate, direct relevance to the employee's job responsibilities.

When questioned about their current use of training methods and the most appropriate methods, sector respondents to the survey provided the following responses in the case of university training:

Generic skills:	Modular university courses	- 27%
	Program-related university courses	- 8%
Management skills:	Modular university courses	- 29%
	Program-related university courses	- 17%
Technical skills:	Modular university courses	- 30%
	Program-related university courses	- 15%

As with the Electrical/Electronics sector, survey results show a strong preference in the Tourism and Hospitality sector for modular delivery. In addition, and particularly for the many owner-operators of facilities, this sector has expressed a desire for distance education delivery of university courses, which brings training to the job site.

Biotechnology

The Canadian Biotechnology industry is an emerging sector of 200 to 300 firms, primarily small- to medium-sized employing less than 25 people, and falling into several categories: foods, medicine, diagnostics and environmental agents. The 1996 national employment base is estimated variously from 11,000 individuals in core companies to 135,000 total employees (of whom 23,121 are biotechnology staff). At either end of the range of estimates, the employment base is not large. This measure of the industry, however, overlooks its importance as a provider of the technology driving transformations in many other sectors in the economy. It also understates the significance of the industry as an employer of highly educated and skilled workers emerging from universities with postgraduate degrees in biology, chemistry, physics and engineering. With a very high level of leading-edge research, the lines between education/training and research activities become blurred, making the sector an intriguing partnership prospect for universities. Finally, the sector has the potential for very significant growth producing highly skilled and well-paid jobs.

Biotechnology firms are not as far advanced as many other sectors in developing human resource strategies. This reflects the relative newness of the sector, the small size of its constituent firms, and the need to focus on technical and scientific issues in the early stages of industry development. The Biotechnology Human Resources Council (BHRC) was established in 1997 and is working to address the issues raised, and recommendations made, by the Paget human resources study of the sector.[5] The BHRC is currently reviewing biotechnology and related programs in the Canadian postsecondary sector to identify gaps between those programs and the competency requirements of the sector. It is also preparing skills inventories for a variety of biotechnology job categories. Both the program review and the skills inventories will be completed by March 1998, at which time a much more complete picture of the universities' potential role in education and training can be developed.

Supply of Graduates and Curriculum Issues

The Paget report estimated that the Biotechnology sector would generate 1,300 new jobs in scientific research and technical and support activities between 1995 and 2000. An additional 2,000 jobs will be created in functions relating to commercialization and 700 positions in management. The BHRC puts job creation at 6,000 over the same period and predicts a shortage of 8,000 to 10,000 people by the year 2000.

The sector review reported a general shortage of experienced technical and scientific personnel and the BHRC is actively pursing the development of a strategic immigration policy to alleviate the shortages. At the same time, it concluded that the Canadian

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5. Human Resources Development Canada (1996), *Building Long-Term Capability Now: Canadian Human Resources Study in Biotechnology.*

postsecondary sector should be capable of fulfilling the demand for postdoctoral fellows, postgraduates, university graduates and technicians, with only localized shortages relating to the development of specialized fields within the sector and in the areas of intellectual property and regulatory requirements.

The fact that employers in the Biotechnology sector perceive experienced personnel to be in short supply at the same time that universities and colleges are deemed to have generally adequate capacity to supply the industry's needs, illustrates its desire to develop scientific expertise through industrial experience. The industry's use of co-operative education programs and the Paget report's recommendation for stronger relationships between the Biotechnology community and the academic and research community as essential to the human resources strategy of the industry are also significant. The industry, then, appears to want to be actively engaged in the development of curriculum, rather than be passive consultants in its design.

Until the BHRC completes its review of university programs, little more can be said about the industry's view of the adequacy of their current offerings. However, it is already clear that employers perceive a lack of nontechnical skills related to the business aspects of the sector in new graduates. The genesis of many firms in the industry may lie in the explorations of scientific minds but the subsequent success of the firm as a business enterprise requires entrepreneurial skills not usually found in university departments of chemistry, physics or biology.

Skills Training and Updating Issues

Given the nature of the Biotechnology sector's activities, it is obvious that scientific and technical skills must be constantly refreshed by the very latest scientific developments. Indeed, there is an almost complete convergence between research and educational activity in the sector. The more mature state of university-industry partnerships in research therefore builds optimism that educational partnerships will flow naturally as a by-product.

The Biotechnology sector has also expressed a critical need for nonscientific training for its employees. The small size of many firms in the sector does not allow for specialized departments handling the business functions of the enterprise, and the industry's scientists/managers require entrepreneurial skills if they are to be successful. There is, also, a strong need for training in regulatory and intellectual property issues. Although there may be a demand for specialized personnel with a scientific MBA training, there is a clear desire for short-term, seminar-based training in these aspects of the sector's business.

Culture

The Cultural sector is highly diverse and not well understood by labour specialists outside of the industry. Especially in an age when scientific advancement is regarded as the engine of growth, the often intangible character of the industry's outputs tends to invite a dismissal of its importance as an economic base. Yet approximately 670,000 people work in the five distinct sub-sectors: music and sound recording; audiovisual and live performing arts; writing and publishing; visual arts and crafts; and heritage (museums, libraries, archives/records management).

The industry has not ignored human resources needs. Many, often significant, training initiatives have been undertaken through in-house training modules, professional development programs delivered by associations of artists, specialized training insitutions such as the Centre for Cultural Management, and other programs. Within the last five years, human resources studies have been conducted on the audiovisual and live performing arts, broadcasting, literary arts and publishing, music and sound recording, and the visual arts and crafts sub-sectors. Only recently, however, has the industry developed a more coherent human resources strategy, including the establishment of the Cultural Human Resources Council in 1995.

The Cultural sector is unique in many respects but, from the standpoint of human resource strategy, perhaps the most important distinguishing characteristic is the nature of the employment relationship. Certainly, larger firms with orthodox employee-employer relationships exist within the industry. There is, however, an unusually high degree of self-employment and contractual work. Approximately 29 percent of the labour force within the sector is fully self-employed with an additional 20 percent partly self-employed. This creates difficult challenges in both the funding and the delivery of training in the industry. The Cultural labour force is also well-educated with about 45 percent having university degrees, compared to 17 percent in the general labour force.

Supply of Graduates and Curriculum Issues

There is no indication that employers in the Cultural sector feel recruitment pressures when hiring from universities and the relatively low incomes in the industry may even suggest excess supply pressures. From 1985 to 1990, the number of fine arts graduates from universities grew by 37 percent and certain sectors, such as publishing, remain attractive destinations for nonpecuniary reasons. The heritage sub-sector has been adversely affected by public sector spending cutbacks, resulting in little hiring and movement of graduates into self-employment. The Cultural sector has been significantly affected by technological change, but any increased demand for technicians to support the core creative activities within the industry will be directed largely to the college system.

The sector regards the traditional arts degree, as currently configured, to be an essential prerequisite to employment in the industry. If there is a dissatisfaction with the curricular content of university courses, it is muted and directed more at the need to

augment the studies than a desire to change them. Specifically, a need is perceived to equip those individuals in the liberal arts programs with "career preparation" or "business" skills without which they will be unable to convert their interests in the arts into vocations. Students entering the sector are often without marketing skills, for example, yet their success in obtaining contract positions depends critically on their skill at marketing themselves. Marketing is also a key missing ingredient within the publishing industry, which requires individuals who are both erudite and entrepreneurial.

Cultural sector representatives have expressed a desire to see curricular changes in arts programs that acknowledge these needs. In the absence of formal course requirements in subjects such as management, entrepreneurship or self-promotion, the sector has found internships to be a useful way of facilitating the transition of new entrants into the cultural industry.

Skills Training and Updating Issues

Many enter the Cultural labour force without the necessary business skills and are quickly put at the front lines of the business aspects of the trade, especially the self-employed. Consequently, there is a critical shortage of business skills among workers in the sector. Professional skills must be augmented by knowledge of contract negotiation, copyright management, sales and marketing, self-promotion and entrepreneurial skills, fundraising and so on. The publishing sub-sector has expressed a particular need for skills related to export and new product development. In addition, since the industry has been significantly affected by computerization, computer skills are now required at all levels.

As with the other sectors reviewed, individuals and employers in the Cultural sector want training delivered in a modular fashion. Given the high proportion of self-employed individuals and university graduates in the industry, there is a real limit to the financial and time resources available for training and little interest in training leading to degrees. The sector is also characterized by a labour force that is widely scattered, leading to a need for university training delivered through distance education methods and in a flexible manner.

Software/Information Technology

As an industrial sector, the Software/Information Technology industry consists of firms that develop software products, embed software in their products and provide software-related services. A 1992 human resources study[6] put employment in the industry at 50,000. Software professionals, however, permeate the economy, providing user support and MIS functions at innumerable corporations in other sectors as well as in government services. The same report estimated the number of these other "in-house" software professionals to be approximately 100,000, giving human resource issues in this sector a more occupational than industrial focus. A 1995 update increased the estimated number of software workers to 173,000 in 1994 but reversed the proportions to 120,000 in the software industry and only 53,000 in the "in-house" group, raising some questions about the data collection methodology.

Despite some uneasiness about the data, there is a consensus that there will be chronic shortfalls in the supply of software workers and that the primary human resources issue in the sector is a question of quantity. There is, for example, less focus on the "multi-skilling" objectives than in the human resource strategies of other sectors (although the need for broader-based education is not completely absent). As an enabler of Canadian comparative advantage, the Software sector views the supply shortage as being critical to national prosperity as well as being critical to industry expansion. The growth imperative is not unique to Canada. In recognition of the economic implications of the programmer shortage for the United States, the Clinton administration established a special initiative in January 1998 to encourage additional training of software professionals.

Supply of Graduates and Curriculum Issues

The Software sector is preoccupied with increasing the flow of graduates with the required software training. The 1995 human resources update reported that almost 50 percent of firms in the industry had unfilled vacancies and, furthermore, projected enormous growth in the number of software professionals that would be required in the next several years. The actual numbers for demand in 1992-94 and projections to 1999 are as follows:

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6. Employment and Immigration Canada (1992), *Software and National Competitiveness: Human Resource Issues and Opportunities.*

1992	165,537
1993	180,144
1994	173,696
1996	227,728
1999	324,374

Employers in the Software sector are notorious for hiring each other's employees, but the bulk of net additions to the workforce as a whole comes from universities. Strategies to alleviate the supply gap include strategic immigration policies and retraining programs for individuals already in the labour force. It is clear, however, that the sector regards postsecondary institutions as being critical in helping to close the gap.

The history of university enrolments in computer science programs is informative. The following table reports the number of Ontario graduates in computer science disciplines from 1986 to 1995. (Note, however, that other, allied disciplines such as mathematics and engineering may also be significant sources of hires requiring only short duration training).

Table 4
Computer Science Graduates from Ontario Universities

Year	No.
1986	1395
1987	1310
1988	1234
1989	1133
1990	927
1991	954
1992	1028
1993	1030
1994	1163
1995	1308

Source: Special Run, Ministry of Education and Training, Universities Branch, Finance

Coming at a time of steady or increasing university enrolments overall, the decline in computer science graduates from 1986 to 1991 must reflect shifting program choices. Although the *Software and National Competitiveness* study reports continuous employment growth in the software field throughout the 1980s and 1990s, the middle of that period was marked by less than unbridled optimism about future job prospects.

If it is true that reduced university enrolments can be traced to this diminished optimism about job prospects, then there is some hope that natural economic forces will come into play in alleviating the supply shortage as job prospects are seen to improve. The significant increase in enrolments in the last five years reported in Table 4 may be inadequate to close the supply gap but it is consistent with this theory, given the recent attention paid to the supply shortage in the popular media and the consequent public awareness. The ability to influence program choices also bodes well for the student internship and awareness initiatives being pursued by the Software Human Resource Council (SHRC).

Much of this discussion is speculative, however, since the supply side of the software labour market is not fully understood. It is not clear, for example, if enrolments are driven largely by student choices or whether universities restrict the number of spaces available for computer studies for financial reasons. The scope for increasing graduation rates through reduced attrition is similarly unknown and ways and means of influencing the program choices of women, who represent a large untapped pool for this sector, are not well understood.[7]

The magnitude of the sector's desired uptake of new university graduates may be troublesome to the extent that it reflects "up-and-out" human resource strategies rather than the net growth in sector employment. There is evidence to suggest that employers in the sector, particularly the smaller ones, have adapted to new technical skill requirements by hiring a new crop of graduates instead of updating the skills of their current employees. This raises serious questions about the wisdom of devoting more societal resources to training for the industry. The so-called "churn and burn" factor may also explain the reluctance of students to enter into information technology careers. Fortunately, the sector shows signs that it has begun to understand the need to come to grips with this issue in ensuring its own long-term viability.

Skills Training and Updating Issues

The postgraduation training environment of the Software sector is also very much influenced by the supply shortage as employers look beyond the postsecondary institutions for new recruits into the industry. For example, the SHRC initiated the Technology Professional Program to provide a one-year information industry training program for college and university graduates from any field of study. Similarly, the O-Vitesse initiative at Carleton University and the University of Ottawa retrains scientists and engineers from other sectors in an 18-month software engineering program. It is interesting to note that, although they are both expedited programs, the training periods are 12 and 18 months in duration, respectively. Unlike other sectors

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7. A 1998 study by Industry Canada (*Results of the Survey on Human Resource Issues in the Information Technology Industry)* may shed light on supply side issues. As well, a recent report by Nortel (1998), *The Supply of High-Technology Professionals*, points to a restriction in the number of places in university engineering programs as a key factor in the supply shortage.

reviewed, where training is often sought to add individual skill components to a worker's human capital, the Software sector is looking to training to build qualified software professionals almost from scratch.

To gain an understanding of the postgraduation training needs in the industry, two other characteristics of the Software sector are worth noting. First, there are a large number of small firms. The 1995 update to the human resources study reports that there were 12,650 firms in the Software industry in 1994 and, of these, 9,600 or three-quarters employed fewer than 10 workers. Not only does the propensity to train vary inversely (and significantly) with firm size, but so too does the ability to develop specialization of labour. The smaller the firm, the more likely it is that an employee engaged in its core activities will become involved in the company's business dealings. Postgraduation training needs within the industry will therefore involve management and entrepreneurial skills.

The second noteworthy characteristic of the sector is the relatively young average age of its labour force. There simply is not a great deal of experience in the industry to help in understanding the longer-term, career-development training needs of its employees.

Given the frenetic pace of development in software, the sector will require significant amounts of technical training to keep the skills of its employees currrent. The sector's human resources council and larger firms in the industry recognize the need to increase their training efforts, which means universities may see opportunities for involvement if they can deliver flexible, modular training on demand.

The purpose of this report has been to review the advanced education and training needs of the five designated sectors and to identify those areas seen by industry as not being adequately addressed by the university community. While each sector has its own unique needs, the review has pointed out issues that are of common concern to all. It is useful to list these common themes, particularly since they are also likely to occur in many other sectors not reviewed in this report.

Common Issues

Supply of Graduates and Curriculum Issues

The broad-based education produced by universities is valued in the workplace.

Increasingly, employers are looking for multidimensional employees and expect even new hires to exhibit an ability to motivate and co-operate with others, to communicate ideas effectively both verbally and in writing, and to engage in lifelong learning. Universities excel at producing these foundational skills, and there is no suggestion that the programs developing these skills are somehow superfluous. Rather, it is a case of employers wanting to augment them with curricula that produce "real world," employability skills.

Sectors want a practical orientation included in university curricula.

From an employer's point of view, the ideal university recruit comes equipped with a good command of his or her discipline of study PLUS the "real world" skills to put that command to use in the business environment of the workplace. A recurring theme of the sector human resource studies is that graduates are often ill-equipped with the entrepreneurial skills that they will need within the firm. Indeed, rarely does a human resource study fail to cite management skills as a critical training need.

Sectors want a more active dialogue with universities.

Employers clearly have a vested interest in the outcomes of the educational process yet have little opportunity for input. Various sector studies point to the frustration that sector councils have had in approaching universities, whether due to disinterest on part of universities or simply due to the logistics of dealing with so many individual, independent-minded entities. Initiatives such as OPAS are critical in fostering the sector-to-sector partnerships needed to establish and maintain dialogue.

Sectors want enrolments to respond more and more quickly to labour market needs.

In the five sectors reviewed, a skills mismatch of serious proportions exists only in the Software sector. It is likely, however, to be a problem in other expanding sectors not covered in this report. It is also likely to be a difficult problem to resolve. Not only must individual program choices be influenced, but also resources within the university sector will have to be reallocated. This is difficult to accomplish when funding is stagnant or declining and may be resisted by universities both for pedagogical reasons and for reasons related to financial risk.

Sectors want increased use of co-operative and other work-based education programs.

Many employers participate in co-op programs as a matter of social contribution. There are also, however, real benefits in terms of influencing curricula, screening potential hires, and fusing real industrial experience with education early in a promising candidate's career.

Skills Training and Updating Issues

A wide range of management and entrepreneurial skills training opportunities are required by the sectors.

Whatever the sector, human resource studies invariably recommend increased training in management skills. Changes in workplace organization are placing demands on individuals for skills once associated only with managers, and smaller firms blur the distinction between operatives and entrepreneurs.

Training must be of immediate relevance and delivered using methods that are flexible and accessible.

Employers are not generally interested in equipping their workers with degrees or diplomas. Indeed, with the exception of the hospitality and tourism sector, many of their employees may already have a postsecondary education. Employers are looking for just-in-time training to develop and enhance specific, well-defined skills. The training must be delivered in an expedited fashion, preferably in such a way that the employee is not forced to leave the workplace for an extended period. The need for training to be modular is expressed in every sector study and cannot be over-emphasized. On-site delivery of training through distance education methods is also highly valued. Of course, no matter

how the training is delivered, it is of little use if it is denied to employees who lack the academic prerequisites normally demanded by university registrars.

Employees need to be exposed regularly to the latest technical developments.

It is particularly true in the area of advanced technical skills where new developments in technology can quickly depreciate the human capital of employees. For many employees, the coexistence of research and teaching functions that distinguishes universities makes them the appropriate places to refresh those skills.

Skills training and upgrading would be improved by better linkages between industry and the university sector.

The relevance and quality of training programs offered by universities will depend on their ability to understand the needs of employers. Employers, in turn, need easier access to the university community to locate the most appropriate training locations.

Conclusion and Recommendations

Pursuing scholarly activities and providing society with its writers, scientists, teachers, innovators and leaders will continue to be the primary mandate of universities. The sector reviews conducted by the Task Force clearly show that the technical and foundational skills acquired by university graduates are highly valued by employers. That review, however, also shows that universities in this knowledge-based economy need to engage in regular dialogue with employers who are increasingly concerned with broadening the range of their employees' skills. This is particularly true as more people pursue a university education for the employment prospects it may bring. It is the Task Force's opinion that a more active involvement by universities in sectoral human resource strategies is both consistent with their social obligations as defined by the institutions themselves and complementary to their academic missions.

Through the close collaboration of its university, industry and government representatives, the Task Force has identified common issues that must be addressed if universities are to play a greater role in meeting the sectors' needs for advanced skills. Possible solutions to some of the issues, reported in the previous section, may be obvious. In other cases, however, innovative and effective solutions must be found through continued collaboration between the university sector, industry and both levels of government. In all cases, ensuring positive results from the implementation of action plans will require the effort and support of these partners. The Task Force's recommendations are, therefore, intended to establish an infrastructure that will support the necessary, ongoing dialogue between these partners and to encourage a strategy to bring solutions to fruition.

In their current financial state, Ontario universities are restricted in their ability to respond to changing labour market needs. With continued erosion of public funding, for example, expanding the capacity of programs serving growth sectors requires reallocating resources within institutions. Few funds are available for investments in new learning technologies or the expansion of co-operative education programs. Universities are nervous about any initiatives involving financial risk, no matter how innovative or potentially productive. The Task Force, therefore, recommends:

Recommendation 1

The Council of Ontario Universities should work with interested parties in industry and government to develop a strategy to provide the financial resources universities need to address the critical skills shortages identified by sectors.

Sector councils are enthusiastic about improved dialogue with Ontario's universities and are ready to discuss their needs in specific and concrete terms. What is required now is an opportunity for contact between the parties.

OPAS has been successful in establishing partnerships between several sectors and universities. The Task Force believes that a general invitation to all Ontario universities to attend individual symposia, one for each sector reviewed in this report, will lead to an expansion of these partnerships and an increased awareness within the university system of the skill needs issues raised in this report. It also believes that ongoing dialogue will naturally flow out of the networking opportunities created by these symposia.

Recommendation 2a

The Office for Partnerships for Advanced Skills should initiate a series of symposia involving the individual sectors reviewed in this report and interested universities.

Action on this recommendation should proceed immediately with a target date of early fall 1998 for the symposia.

The needs articulated by the sectors are diverse and, at times, surprising. Witness the requirement for legal skills in the Biotechnology sector, marketing skills in the Cultural sector, and management skills in the Electrical/Electronics sector. These needs are also continually evolving. Mechanisms are required through which universities can stay apprised not only of the professional or technical skill requirements of each sector but also of the "real world" skills they might not otherwise anticipate. Finding ways of interjecting these skills into the university curricula will be challenging and the institutions may profitably work together to find solutions.

The recommended symposia will provide an opportunity to resolve some of these issues, although there will still be a need for ongoing dialogue between universities themselves and between the university system and industry. The symposia should, in part, be devoted to finding mechanisms for accomplishing this.

Recommendation 2b

With leadership from the Council of Ontario Universities and the Office for Partnerships for Advanced Skills, Ontario universities should establish advisory groups that include industry representatives to review professional needs for trans-disciplinary skills, such as entrepreneurship, marketing, and financial skills, and methods of incorporating these skills into university curricula.

The establishment of sectoral skills councils has been profoundly important to the development of comprehensive human resources strategies. With 23 councils currently in existence, there is considerable scope for expanding university partnerships beyond the five industries discussed in this report.

Recommendation 3

The Office for Partnerships for Advanced Skills should continue the process that began in 1993 by establishing a dialogue with additional sector councils and other sectoral organizations.

The Task Force believes that there would be considerable merit in replicating the OPAS model at a national level. It is well beyond the mandate of OPAS to act on behalf of all Canadian universities but, as a leader in this area, OPAS can lend its experience to its counterparts in other provinces and to national agencies. A national symposium, patterned after the one that laid the groundwork for OPAS in Ontario and based on the results of this report, may be an effective starting point.

Recommendation 4

The Office for Partnerships for Advanced Skills should facilitate a symposium, originating in Ontario but including real or virtual links outside the province, to disseminate the information collected by this Task Force.

The Task Force is satisfied that its work has been important and that its findings are useful. It also believes that the initiative and concern displayed by COU in establishing the Task Force has been well received by industry and by government. COU should

continue its involvement in the sectoral skill needs arena. There is a very real danger that, without active leadership, the processes recommended in this report will falter before solutions can be implemented. It is essential that COU continue to provide this leadership.

Recommendation 5

The Council of Ontario Universities must continue to be actively involved in ensuring the processes set out in the previous recommendations produce action plans that will address advanced sectoral skill needs.

This report bears the sub-title "The Role of Universities." It should be clear, however, that sectoral skill needs will not be met by universities acting alone and that industry and both levels of government also have very important roles. Indeed, if there is an overarching theme in this report, it is one of collaboration and dialogue between these groups. Ontario's universities, together with the Colleges of Applied Arts and Technology, are a profoundly important resource in the strategic development of human resources. If they are to respond effectively to emerging skill needs in industry, however, they will require the support of government and of industry itself.

Appendix A

Members of the Task Force on Labour Market Issues

Dr. Richard Van Loon, President, Carleton University, Ottawa (Chair)
Mr. Bruce Baldwin, Director, Labour Market Policy Planning & Research Branch, Ministry of Education and Training, Toronto
Mr. Neil Cooney, Vice President, Human Resources, IBM, Markham
Dr. Torben Drewes, Department Of Economics, Trent University, Peterborough
Mr. Gaylen Duncan, President & CEO, Information Technology Association of Canada, Mississauga
Dr. David Edge, Vice President, Lever Ponds (Chemicals sector), Toronto
Dr. Carole Farber, University of Western Ontario, London
Ms. Martha Fletcher, Manager, Technology & Training Development, Ministry of Economic Development, Trade and Tourism, Toronto
Ms. Amy Hanen, Director, Learning Systems, CIBC, Toronto
Ms. Ann Masson, Manager, Business Training & Adjustment, Ministry of Education & Training, Toronto
Dr. Noah Meltz, Principal, Woodsworth College, University of Toronto, Toronto
Ms. Martha Nixon, Executive Director, Human Resources Development Canada, Ottawa
Dr. Al Oatridge, Center for Advanced Technology Training, Ryerson University, Toronto
Mr. Wayne Scott, Government Programs, Law & Corporate Relations, IBM, Markham
Dr. Norm Shulman, Executive Director, Office for Partnerships for Advanced Skills, Toronto

The Task Force benefitted from the involvement of the following individuals:

Mr. Cal Stotyn, Manager, Sectoral Partnerships Delivery Division, Human Resources Development Canada, Ottawa
Mr. Scott Weeres, Acting Director, Cultural Policy Branch, Ministry of Citizenship, Culture & Recreation, Toronto

Appendix B

Sector Representatives

The Task Force met with the following sector representatives:

Biotechnology Sector

Mr. Rene Douville, Senior Market Manager, Royal Bank of Canada
Ms. Joyce Groote, President, Industrial Biotechnology Association of Canada (IBAC)

Cultural Sector

Bill Hanna, Vice-President, Stoddart Publishing
Paul Hoffert, Chair, Ontario Arts Council
Linda Mackenzie, Deputy CEO, North York Public Library
Catherine Smalley, Projects Manager, Ontario Sectoral Council for Culture
Jean-Philippe Tabet, Executive Director, Cultural Human Resources Council/CRHSC

Software/Information Technology

Bob Bilsborough, Director of Compensation, Nortel
Varta Bruce, Manager of Recruiting, SHL Systemhouse
Fred Grigsby, Director of Information Systems and Process Automation, Dofasco
Gerry Kluwak, Vice President Corporate Development,
Information Technology Institute (ITI)
Steve Ralphs, CEO, I-SYS Group
Ernie Raymond, President, Permond Solutions
Graham Thompson, Director, Learning Initiatives, Mitel
Howard Williamson, Chair, Ottawa-Outaouais Human Resources Task Force

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Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

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