Is it Possible to Accurately Forecast Labour market Needs?

Overview

The purpose of this question scan was to determine the feasibility of conducting a systematic review of the literature devoted to educational planning for an expected skill shortage. This broad topic was divided into two questions:

a) Is it possible to use labour market needs as a mechanism for determining access to postsecondary opportunities?
b) Is it possible to accurately forecast labour market needs?

Searches applying a broad range of applicable search terms to four major databases initially yielded 291 articles potentially relevant to either or both questions. Subsequent examination of article abstracts reduced the number to 134. Of these, 97 seemed to address question ‘a’, and 86 seemed to address question ‘b’. Many of the articles were relevant to both. A search of government and professional/sectoral organisation websites yielded an additional 16 documents potentially pertaining to both questions.

Question ‘a’

An initial review revealed a few articles directly addressing the use of labour market forecasting to establish post secondary access. Often this literature comprises government reports, and describes specific cases where jurisdictions attempted to match the programs offered at colleges to the requests of local employers. These documents appear difficult to access in cases where they will have to be mail-ordered from the appropriate authority; in other cases, full text documents are available on the web.

The scholarly material pertaining to question ‘a’ encompasses a range of genres: editorials advocating for stronger ties between the labour market and post secondary institutions; qualitative studies describing workforce development at colleges; and, quantitative work that indicates where opportunities in the future may lie, and hence what sorts of training are necessary. Overall however, quantitative work addressing question ‘a’ is thin (see *Findings* below for examples from all genres).

Question ‘b’

Literature speaking directly to question ‘b’ appears to be of four types: (1) generic theoretical models of labour forecasting; (2) models for labour market forecasting in specific industries or occupational sectors; (3) reports or descriptions of actual labour market forecasts; and (4) evaluations and/or critiques of labour market forecasting methods and actual forecasts.

Often little can be gleaned by surveying the abstracts of articles pertaining exclusively to question ‘b’. Labour market forecasting techniques seem to vary widely in their sophistication. Some commentators seem to find simple forecasting methods unsatisfactory.

Observations

Quantitative: 29 articles- Included under this heading is any scholarly literature that marshals statistical evidence to make its case. These articles include experimental, quasi-experimental, and large scale descriptive studies (e.g. surveys and questionnaires), usually the latter. Often these studies predict where and how numerous vacancies will be in various occupational sectors [e.g. Braddock (1999) *Occupational Employment Projections to 2008*] and describe in what fields graduates are likely to go for work [e.g. Finnie (2001) *Fields of plenty, fields of lean: the early labour market outcomes of Canadian university graduates by discipline*]. Persistent themes include the shortage of scientists, engineers and information technologists, and the need to recruit non-traditional candidates to these sectors, e.g. women, minorities and low SES people.

Qualitative 55 articles – Included under this heading are descriptive case studies, narratives and interviews, generally published in academic journals. Theoretical models, critiques and evaluations of programs, and non-statistical projections are also included here.

Nineteen of the articles come from the same (2000) book, *Vocational education and training reform: Matching skills to markets and budgets*, a publication of case studies of different countries' abilities to match education to labour market needs. Many other case studies describe successes and failures of programs designed to meet labour market needs at community colleges and vocational institutes. Small scale programs [where local community colleges and industry determined labour market needs together and then developed relevant programs] appear to have been successful. For example, Gennet, Johnston and Wilson's (2001) *The shift to workforce development* describes a local industry- community college alliance that resulted in market relevant training opportunities. Industry input of industry needs is highlighted in this study and elsewhere. Some literature highlights industry's desire for general skills, communication and cooperation, critical thinking, and mathematical ability, rather than specific occupational training, e.g. Kirwan (1990) *Meeting the mathematical needs of our nation's work force.*

The qualitative literature also:

- describes forecasting methodologies, e.g. LaSage (1990) *Forecasting metropolitan employment using an export-base error-correction model*;
- evaluates specific labour market forecasts, e.g. Rosenthal (1999) *The quality of BLS projections: a historical account*;
- and, evaluates labour market forecasting techniques, e.g. Fawson and Criddle (1994) *A comparative analysis of time series approaches to modeling intersectoral and intercounty employment linkages in rural regional labor markets.*

These and other studies indicate: a) labour market forecasting techniques range from very simple to very sophisticated, and b) the accuracy of labour market forecasts appears controversial, especially to the extent they do not account for the dynamic nature of labour markets.

Editorials: 14 articles- These are position or opinion papers advocating for certain principles or practices when preparing a workforce through higher education, or conducting labour market analyses. Some articles may present relevant reasons for adopting certain practices. Themes include those mentioned in paragraphs above, as well as exhortations for colleges to meet the challenges of the skills shortage, e.g. Malcomson (2002) *Workplace Learning: The role of Canadian colleges and institutes in meeting Canada's professional, technical and trade skills challenges* and, though less numerous, critiques of the notion of a looming skills shortage, e.g. Hyslop-Margison and Welsh (2003) *Career education and labour market conditions: The skills gap myth.*

Reviews: 8 articles- Included under this heading are articles that review literature on forecasting labour markets, and using labour market needs to determine post secondary structures. Also included are compendiums of reports and research papers in a single topic area, often presented at conferences. Two potentially useful reviews in examining accuracy in labour market forecasting are van der Laan's (1996) *A review of regional labour supply and demand forecasting in the European Union*, and a 1998 compendium of papers, *Skill needs: Linking labour market analysis and vocational training.*

Reports: 28 documents – These are government-produced studies generally documenting labour market forecasts or programs that respond to labour market forecasts. Also included here are testimonies before government subcommittees. Two are highly relevant for question 'a':

- Sommers and Heg's (2000) *Matching community and technical college professional/technical education capacity to employer demand. Final report*. This article is available in full text and describes how community colleges in the state of Washington used labour market forecasts to respond to education and training needs.
- Kotamraju, Steuernagel and Jacquart's (2002) *New program development strategy and supply/demand analysis: The relationship between postsecondary degree program outcomes and occupational needs in Minnesota* which describes how the Minnesota State Colleges and Universities system determines what degree programs will be created, based on needs for workers in various occupations in the state.

A key report for question 'b' is

- Borghans, de Grip and Heijke's (1996) *Concepts and methodology for labour market forecasts by occupation and qualification in the context of a flexible labour market* for introductions to sophisticated forecasting techniques.

Although often highly relevant, some reports may be hard to access, available only by mail from the jurisdictional authority.

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Grey Literature: 16 documents –. Grey literature may subsume any of the above four genres. Documents include reports made available on the internet in pdf, such as the Association of Canadian Community Colleges' (2001) *How can we work sectorally in a*

province? and web based information, such as *Workfutures* (see bullet below). Of particular use may be:

- Statistics Canada's *The Canadian labour market at a glance,* which highlights of key trends in Canada's job market;
- *Workfutures: British Columbia occupational outlooks* which includes occupational opportunity projections;
- And, the BC government report *Environmental scan: British Columbia's learning and labour market environment* which examines interrelationships between socio-demographic, economic, labour market and learning trends and issues.

Further pervasive themes

Many of the themes mentioned above crosscut the genres. Pervasive themes not specifically mentioned above include:

- Western nations must build a workforce able to function in the "new economy" characterised by knowledge work more than physical labour.
- The chief role for workplace training belongs to community colleges and vocational institutes. These organisations must rise to the challenge.
- Skill upgrading should occur in the workplace but largely does not.
- Possibly, small scale (industry/community specific) forecasts are most accurate and amenable to educational planning
- Labour market information can be useful in planning educational programs.

Summary

Although more empirical data (a) describing eventual outcomes of students accepted on the basis of labour market forecasts and (b) comparing labour market forecasts to eventual conditions would be desirable, there appears to be enough relevant literature here to formulate informed policy responses to either or both of the posed questions. Although qualitative research is not generalisable, there appear to be enough cases and government reports to create the "preponderance of evidence" upon which policy decisions relying on qualitative work should be based. Possible policy implications include:

- Using labour market forecasting critically and judiciously.
- Encouraging small scale collaborative planning between community colleges/vocational institutes and local industries to determine and respond to educational needs of industry.
- Recruiting non-traditional students – e.g. women, minorities, immigrants, low income - to occupations with most need: probably science, engineering and high-tech sectors.
- Maintaining a curriculum of transferable general skills – communication, cooperation, critical thinking, mathematics etc. – to complement industry specific training.
- Encouraging community colleges/ vocational institutes to take a leadership role in responding the skills shortage.

Feasibility

The volume and diversity of the literature in this domain is sufficient to warrant a systematic review of the literature. It is estimated that such a review can be undertaken in approximately 4 person months at a cost of approximately $25,000.

Appendix A: Included References

References - Canada

Sectoral skills needs: The Role of Universities. Task Force on Labour Market Issues: Office for partnerships for advanced skills. (1998).
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.

Ashton, D. N., Green, F., & Lowe, G. S. (1993). The Linkages Between Education and Employment in Canada and the United Kingdom: A comparative analysis. *Comparative Education, 29*(2), 125-143.

Association of Canadian Community Colleges. *A national skills agenda.* Retrieved September 26, 2005 from http://www.accc.ca/ftp/briefs-memoires/election-skills.pdf

Association of Universities and Colleges of Canada. (2000). *Toward a learning society, learning economy: An action plan for Canada*. Ottawa: Association of Universities and Colleges of Canada. September 26, 2005, from the World Wide Web database.

Association of Universities and Colleges of Canada. *Advanced skills for the knowledge economy* (Background report September 26, 2005, from the World Wide Web database.

Axelrod, P. (1999). *The uncertain future of liberal education.* Retrieved September 26, 2005 from http://www.caut.ca/en/bulletin/issues/1999_sep/99_oct/commentary.htm

British Columbia Statistics. (2004). *British Columbia Employment by Industry* (N/A ed.). BC: BC Statistics. Retrieved September 26, 2005, from http://www.bcstats.gov.bc.ca/data/dd/handout/naicsann.pdf

Clark, Warren. (1999). Search for success: Finding work after graduation [1997 data]. *Canadian Social Trends,* (53),10.
Graduates in some fields had a much less difficult job search experience than others; the health professions, sciences and technologies field was one of these. Many health-related fields have restrictive entrance requirements with very limited numbers of spaces, thereby controlling the number of graduates entering the labour market. Bachelor's graduates from these fields had the least trouble of all university graduates deciding what they wanted to be, knowing how to find jobs, finding jobs related to their field of study and finding a job that paid enough. For them, finding a job in the desired location was the hardest task, although still less difficult than for other fields. College graduates from health-related fields enjoyed similar experiences but also had more difficulty than other college graduates finding a job where they wanted to live. Some graduates began their first post-graduation job long before they graduated, and in some cases before they began their program: 6% of college and 8% of bachelor's graduates had been working at their first post-graduation job for five or more years before they graduated. About one-third of bachelor's graduates in this group were over age 30 working full-time in professional, semi-professional, senior or middle management, or technician jobs while pursuing part-time studies. Another 39% were under age 30 working as semiskilled or unskilled labourers. About 29% of college graduates who started five years or more before graduation were in high level jobs. Other graduates started working while they were at university or college. Among graduates with jobs that began one to four years before graduation (early starters), over half were in clerical, sales and service occupations: in other words, the type of part-time jobs that many students use to help finance their education. In contrast, graduates starting their first post-graduation job after graduating were more likely to be in professional or technical jobs. Early starters were more likely to stay in the same job than graduates who started to work after graduation. In fact, more than 70% of early starters had the same job one year after graduation, but only 47% of bachelor's and 52% of college graduates who had started their first job within three months of graduation were still in that job 12 months later.

College Institute educators Association. (2003). *A new model for industry training in BC* (Discussion Paper No. N/A). Vancouver, BC: Federation of Post Secondary Educators. September 26, 2005, from the World Wide Web database.

Cross, P. (2005). Recent changes in the labour market. *Canadian Economic Observer,* Retrieved September 26, 2005, from the World Wide Web database.

Finnie, Ross. (2001). Fields of plenty, fields of lean: The early labour market outcomes of Canadian university graduates by discipline. *The Canadian Journal of Higher Education, 31*(1), 141.
No specialization 30,800[Symbol Not Transcribed] 37,800[Symbol Not Transcribed] 23 66[Symbol Not Transcribed] 67[Symbol Not Transcribed] 80[Symbol Not Transcribed] 76[Symbol Not Transcribed] Other Health 45,500[Symbol Not Transcribed] 51,300[Symbol Not Transcribed] 13 74[Symbol Not Transcribed]

73[Symbol Not Transcribed] 88 82[Symbol Not Transcribed] Computer Science 36,100[Symbol Not Transcribed] 41,800[Symbol Not Transcribed] 16 70[Symbol Not Transcribed] 71[Symbol Not Transcribed] 81[Symbol Not Transcribed] 73[Symbol Not Transcribed]

Government of British Columbia. (N/A). In Government of British Columbia (Ed.), *Making sense of career and labour market information* (N/A ed.). BC: Government of British Columbia. Retrieved September 26, 2005, from http://www.publications.gov.bc.ca/pubdetail.aspx?nato=7960002652

Government of British Columbia. (1998). *Environmental scan: British Columbia's learning and labour market environment*. British Columbia: Government of British Columbia. Retrieved September 26, 2005, from http://www.publications.gov.bc.ca/pubdetail.aspx?nato=7665001962

Government of British Columbia. *Workfutures: British Columbia occupational outlooks.* Retrieved September 26, 2005 from http://www.workfutures.bc.ca/

Hyslop-Margison, E. J., & Welsh, B. H. (2003). Career education and labour market conditions: The skills gap myth. *Journal of Educational Thought/Revue De La Pensee Educative, 37*(1), 5-22.
Asserts that it is a questionable claim that a widespread knowledge and skill shortage is causing current labour market supply problems, unemployment, or increased social stratification. Adds that the percentage of new jobs requiring high levels of knowledge and skill is limited when compared to low-skilled service industry occupations. Questions the foundations of career education.

Kenny, M., & Shaw, R. (2001). *How can we work sectorally in a province?* (tech rep No. x). Ottawa: Atlantic Home Building & Renovation Sector Council and the Nova Scotia Community College. September 26, 2005, from the World Wide Web database.

Lawton, Stephen, & Press, Harold. (1999). The changing teacher labor market in Canada: Patterns and conditions. *Alberta Journal of Educational Research, 45*(2), 154.
Plusieurs groupes peuvent beneficier de l'acces a de l'information actuelle et liable sur le marche du travail des enseignants: les gouvernements impliques dans le developpement et la mise sur pied de politiques sur l'allocation de ressources et la planification de la main d'oeuvre; les facultes universitaires de pedagogie qui offrent des programmes deformation prealable des enseignants; des federations d'enseignants impliquees dans le developpement professionnel des enseignants; les districts scolaires impliques dans la mobilisation des ressources; les ecoles impliquees dans la planification et l'offre de programmes et de services de qualite aux etudiants; et les etudiants soucieux de la qualite et de l'envergure des programmes. L'incertitude du marche du travail et le besoin d'information sur la planification de carriere constituent des questions d'importance cruciale pour les etudiants en pedagogie. Cette etude analyse la qualite et l'envergure du marche du

travail des enseignants en evolution et evalue la qualite et la valeur de l'information sur le marche du travail des enseignants. Les chercheurs ont trouve que, a quelques exceptions pres, les districts scolaires au Canada connaissaient un surplus d'enseignants. Ils ont egalement appris que l'information sur le marche du travail des enseignants s'averait utile a differents groupes pour des raisons differentes. Par rapport aux administrateurs, les etudiants etaient plus portes a se servir de l'information et a appuyer une politique qui lierait la selection des etudiants aux conditions entourant la demande d'enseignants.

Levin, J. S. (2002). In education and in work: The globalized community college. *Canadian Journal of Higher Education, 32*(2), 47-77.
This is a multiple case study of seven colleges using field methods research to examine institutional life and organizational context. This study determines that community colleges in both Canada and the United States exhibited educational and work behaviors in the 1990s consistent with the globalization process. Education was oriented to the marketplace, and the needs of business and industry received high priority in educational programming. Work within these institutions was valued for and carried out with economic ends: to realize productivity and efficiency. Cette etude de cas multiples a ete realisee aupres de sept colleges communautaires et utilise des methodes de recherche sur le terrain afin d'examiner ces etablissements d'enseignement superieur et leur contexte organisationnel. Cette etude constate que, dans les annees 90, les colleges communautaires aux Etats-Unis et au Canada fonctionnaient dans le domaine educatif et du travail de maniere compatible avec le processus de mondialisation. L'education s'orientait vers le marche, et les besoins des entreprises et industries avaient une priorite tres elevee dans le cursus educatif. Le travail dans l'enceinte de ces etablissements etait valorise et mis en oeuvre avec cet objectif economique: production et efficacite.

Levin, Benjamin. (1995). How can schools respond to changes in work? *Canadian Vocational Journal, 30*(3), 8.

Malcolmson, L., Ed. (2002). Workplace learning: The role of Canadian colleges and institutes in meeting Canada's professional, technical and trade skills challenges = L'apprentissage en milieu de travail: Le role des colleges et instituts canadiens face aux defis canadiens en matiere des competences professionnels et techniques. *College Canada, 7*(1)
This issue examines selected topics in vocational education in Canadian community colleges. It focuses on the central themes of community college and industry partnerships, vocational education assessment, and vocational and workplace education pedagogical models. Articles include: (1) "Industry and Colleges: Key Partners in Meeting Canada's Skills Challenge," by Perrin Beatty, which examines the increasing demand for Canadian community colleges to supply readily employable, skilled workers and the challenges in finding more effective partnerships to increase efficiency between industry and education; (2) "TOWES [Test of Workplace Essential Skills]," by Conrad Murphy and Michael Herzog, which looks at the TOWES and its value as an educational and industry assessment

tool; (3) "Workplace Education That Works," by Donna Allan, which is a report from Lethbridge Community College about its programs and services in vocational education; (4) "It's not Rocket Science-but Someone Has to Fix the Space Shuttle," by Michael Kidney and Sue Boutlier, which looks at the ways in which community college vocational education instructional programs can work effectively with private partners to increase student learning outcomes; (5) "GM-Niagara College Partnerships: An Evolution from Training to Learning," by Bea Clark, which chronicles the development of a partnership between General Motors (GM) of Canada and Niagara College; and (6) "Applied Research Transfer to the Workplace through Training and Learning-A Brief Example," by Chantale Perreault, which summarizes findings from a case study of how a new degree program can increase the quality of a vocational education program.

Ministry of Advanced Education and Human Resources Development Canada. (2003). *What's Key in Labour Market Information in BC*. BC: Government of British Columbia. Retrieved September 26, 2006, from http://www.whatskey.org

Murphy, J. (1992). A policy paper on applied education. *Canadian Vocational Journal, 28*(2), 17-19.
Applied education, the integration of academic and vocational curricula, cannot supply the trained people needed by a rapidly changing society without sufficient planning and resources. Shortages of skilled workers are a societal issue requiring significant structural adjustment in the way skilled trades are managed.

Quinlan, Liz. (1997). Saskatchewan's training strategy. *Briar Patch, 26*(6), 7.
In order to develop a skilled work - force which is relevant to Saskatchewan's labour market, one must first anticipate certain characteristics about the province's future labour market. What type of jobs will exist, what skills will be necessary in order to perform them, and what skills are already held by the work - force? The architects of the Training Strategy claim that by the year 2000 there will be ten percent more training opportunities in Saskatchewan compared to 1996. With the provincial government now having to replace federal cuts to apprenticeship and adult basic education programs, the total provincial investment is said to translate into 8,500 new places in training and employment programs. Although the authors hint at some kind of complementary job creation strategy, there is little assurance that the 8,500 newly trained people will have jobs to go to. By presenting historical data on the change in employment in various economic sectors over the past decade in the province, the document implies that future growth in Saskatchewan will be in service industries and manufacturing. But trends of past decades may not predict the future well.

Redpath, Lindsay. (1994). Education - job mismatch among Canadian university graduates: Implications for employers and educators. *The Canadian Journal of Higher Education, 24*(2), 89.

Saskatchewan Inst. of Applied Science and Technology, Saskatoon. (2003). *Saskatchewan urban training needs assessment report, 2003* No. SIASTR0303). Canada; Saskatchewan:
As part of an annual program planning process, Saskatchewan Institute of Applied Science and Technology (SIAST) conducts a number of formal and informal consultations with various SIAST stakeholders in order to identify and research future program training needs in the province of Saskatchewan, Canada. This Saskatchewan Urban Training Needs Assessment Report (SUTNA) 2003 was produced following the compilation of all research conducted during the spring. The 2001 Census year population of Saskatchewan was 978,933, which is a decline of 11,305 people from the 1996 Census. Saskatchewan has a greater proportion of the population in the 0-14, 15-24, and 65 and older population than does the rest of Canada. The greater abundance of population aged 0-24 should bode well for the province in light of the pending labor shortages expected in the near future. The SUTNA 2003 report is divided into three categories: (1) Demographic and Economic Information, reports on data regarding labor market information and economic activities and trends; (2) Summary of Training Needs Assessment Industry Consultations, reports on the primary research obtained from stakeholder consultations; and (3) Summaries of Relevant Studies and Reports, records the summaries of the sector partnership studies that have been completed within the last year. Research instrument appended.

Schrier, D. (2000). *British Columbia labour force participation rate model* (N/A No. N/A). BC: Government of British Columbia. September 26, 2005, from the World Wide Web database.

Statistics Canada. (2004). *The Canadian labour market at a glance* (N/A No. N/A). Ottawa: Statistics Canada. September 26 2005, from the World Wide web database.

Statistics Canada. (2002). *Labour force information* (N/A No. N/A). Ottawa: Statistics Canada. September 26, 2005, from the World Wide Web database.

Taylor, Alison, & Lehmann, Wolfgang. (2002). "Reinventing" vocational education policy: Pitfalls and possibilities. *Alberta Journal of Educational Research, 48*(2), 139.
In the 1980s and 1990s the department of education in Alberta initiated several policy processes aimed at making educational programs more relevant to changing political, social, and economic realities. The Review of Secondary Programs (Alberta Education, 1984) was commissioned by Education Minister Dave King, followed by a practical arts review undertaken in 1988 by the Curriculum Development Branch (1989). In the early 1990s the province also introduced a Registered Apprenticeship Program (RAP), aimed at encouraging high school students to consider careers in the trades. The goal of developing a more outcomes-based, accountable system was expressed in Education Minister Jim Dinning's Vision for the Nineties (Alberta Education, 1991) and operationalized in Minister Halvar Jonson's Three-Year Business Plan for Education (Alberta Education, 1994s).

The Framework for Enhancing Business Involvement in Education (Alberta Education, 1996a) was part of the process of implementing key components in this three-year plan. Three key transition initiatives began in the 1990s through the combined efforts of business leaders, school districts, and government representatives: the Registered Apprenticeship Program or RAP (introduced in 1991), Tech Prep (begun in Red Deer in 1995), and CNG (piloted in 1993). RAP and CNG were arguably driven by labor market demand. For example, a recently retired bureaucrat from Alberta Learning suggests that "the impetus for RAP was that the Alberta economy was heating up" (Interview, September 27, 2001). A participant from CNG adds that a number of pulp mill announcements in the mid-1980s added to employers' concerns about shortages (Interview, January 26, 2001). In response, the government began to look at youth apprenticeship programs in other provinces and undertook a series of projects in partnership with the Alberta Chamber of Resources, leading to a three-year pilot project (1993-1996) called Careers, the Next Generation. Tech Prep was more educator-driven, based on models in the US. The government later began to support consortia across the province. The following sections outline these initiatives. The Central Alberta consortium began as a pilot project funded for three years by federal Human Resources Development Canada under its Young Internship programs and is currently funded by Alberta Human Resources and Employment (provincial), consortium partners, and industry sponsors.(3) Alberta Tech Prep also receives $50,000 funding annually from Alberta Learning to promote the concept across the province. When asked whether there could be changes in Tech Prep programs, the consortium representative said, "I would love to see more funding come from Alberta Learning.... it's a smattering here and there and it's not a provincial initiative yet in my opinion" (Interview, p. 21). Therefore, although Tech Prep's strength is that it potentially provides a variety of pathways that connect to work or further study, the lack of provincial resources limits expansion. The lack of province-wide articulation agreements with colleges and their restricted scope are other weaknesses.

University Presidents' Council of British Columbia. (2003). *Mandates roles and responsibilities in the public postsecondary education system in British Columbia* (Response Paper No. N/A). BC: University Presidents' Council of British Columbia. September 26, 2005, from the World Wide Web database.

Walker, S. P. (1992). Labour trends and training needs in British Columbia.
In an effort to meet the training needs of the British Columbia (BC) labor force, Open College (OC), in Burnaby, has focused future activities on market-driven, employer-centered training programs utilizing advanced technologies and traditional on-site instructional methods. Designed to ensure that these courses and programs reflect actual labor demands, this report examines BC's training needs, details economic and labor market trends and forces, identifies the extent to which training needs have been changed by such factors as industry demands and political developments, and recommends ways in which OC's programs can upgrade the level of skills of the BC labor force. After an introductory section discussing the purpose and methodology of the report, part II provides an economic and labor market

overview, detailing information on: (1) a world overview, examining economic trends in the United States, Europe, and Asia; (2) the Canadian economy, reviewing demographics and employment, productivity, trade, and industrial development; (3) the BC economy; (4) provincial industries and industrial development; (5) developments in the workplace; (6) occupations and demand; (7) critical skills; (8) skills shortages; and (9) training trends, examining such areas as expenditures, delivery methods, and governmental role. Part III presents a series of recommendations for OC, emphasizing the need for training in information technology, management and supervision, workplace literacy, and total quality management. Appendixes include a map of BC, a table of government funding for training programs, profiles of the six BC regions, and BC industry profiles by region. An autumn 1992 update on the economic and market overview is attached.

Walters, David. (2004). A comparison of the labour market outcomes of postsecondary graduates of various levels and fields over a four-cohort period. *Canadian Journal of Sociology, 29*(1), 1.

Past research which has made labour market comparisons among graduates of different levels of postsecondary schooling has found that graduates with university degrees have better labour market outcomes than graduates with community college diplomas, who in turn, have better outcomes than graduates of trades and technical programs (Allen, 1999b). This same study also found that graduates of higher level university programs (i.e. master's and Ph.D.) have the best labour market outcomes of all postsecondary graduates. However, past studies dealing with the transitions from school to work are subject to a number of limitations. Recent research that has distinguished among different fields of study has generally focused only on university graduates (Krahn and Lowe, 1998; Hay, 2000; Lin et al., 2000; Axelrod et al., 2001; Butlin, 2001; Finnie, 2001). At the same time, other research which compares graduates of different levels of schooling does not control for field of study (Christie and Shannon, 2001; Finnie, 2000a; 2000b). Even fewer studies have made comparisons over time,(6) and no studies could be found that make these comparisons while controlling for field of study. As can also be seen in Figure 4, graduates of the fine arts, humanities, social sciences, and "other" programs have the greatest likelihood of being unemployed. Agricultural and biological sciences graduates have a lower probability of being unemployed than social science graduates, and engineering graduates generally have a lower probability of being unemployed than agricultural and biological sciences graduates (except in the case of the 1990 cohort, when engineering graduates had a slightly higher probability of being unemployed). Commerce graduates generally have a probability of being unemployed that is lower than that of engineering graduates (except in the case of the 1995 cohort). Next to graduates of health programs, graduates of education programs generally have the lowest probability of being unemployed. Comparisons of postsecondary graduates over a longer period of time would also be extremely valuable. Fortunately, the two-year follow-up survey of 2000 graduates is under way, and when the data becomes available, researchers will be able to compare the employment outcomes of the 2000 graduates with those of earlier cohorts. The 2000 NGS will be particularly valuable to those conducting research on the changing

needs of the economy, given that the graduates of this cohort are more likely to have been affected by the recent rapid expansion of the Internet and other forms of information technology. At the same time, the labour market requirements of the economy will become increasingly complex as the population ages. The retirement of teachers and other public service employees will certainly affect the employment opportunities of large numbers of postsecondary graduates in the near future. In fact, it has also been argued that health fields will rapidly expand because of the greater need for health care services given the aging of the Canadian population (Foote and Stoffman, 1996: 52). Future NGS surveys will be valuable for determining how the school-to-work transitions for postsecondary graduates are affected during this period.

Williams, Bob. (2000). Toward a sensible school-to-work system. *Education Canada, 40*(2), 15.
Afin que notre pays demeure competitif, plus de jeunes hommes et de jeunes femmes doivent atteindre des niveaux de reussite que seulement quelques-uns et quelques-unes atteignaient auparavant. L'insertion professionnelle est une methode d'enseignement qui vise a rendre le programme du 2[Symbol Not Transcribed]e cycle du secondaire mieux adapte. Pour ce faire, elle insiste sur la mise en pratique des connaissances scolaires dans un cadre reel de travail et ce, dans divers secteurs industriels. Quand les programmes sont bien concus et qu'ils appliquent la methode de facon rigoureuse, ils produisent des eleves qui sont plus motives, qui ont une meilleure idee du metier qu'ils veulent exercer et qui ont les aptitudes necessaires pour apprendre tout au long de leur vie.

References - USA

Making HEA an engine of economic productivity and worker prosperity.(2005). *Center for Law and Social Policy CLASP*,
The Higher Education Act (HEA) can be a key part of the solution to the coming "skills gap" resulting from the lack of skilled workers with postsecondary education entering the workforce. HEA should be modernized to support economic development, meet the needs of businesses and workers, and assist the growing number of "nontraditional" undergraduates in balancing school work and family while protecting them from growing levels of college debt. [Report also produced by the National Consumer Law Center and The Workforce Alliance.]

Conducting a community audit: Assessing the workforce development needs and resources of your community.(2000).
This document details the purposes and principles of community audits and presents guidelines for designing and conducting a community audit to assess a local community's workforce development needs and resources. Section 1 presents an overview of the U.S. Department of Labor's Community Audit Project and explains the following key steps in launching a successful community audit: defining the

goals; building the stakeholder partnership; determining the scope; selecting methods and an approach; finding the resources; utilizing the resources; and determining the products. Section 2 explains the following techniques for conducting a baseline community audit: defining the geographic scope; finding the data; analyzing the demand side; analyzing the supply side; mapping the community's assets; and determining who should conduct the research. Section 3 discusses the following specialized community audits and techniques: sector and cluster analysis; detailed occupation and skill analysis; mapping career ladders; vacancy surveys, identification of skills shortages; use of rapid response and job developers; and business visitation programs. Section 4 explains how to use the following tools and strategies to tailor community audits to support local strategies: employing/reemploying a target population; sectoral strategies; layoff aversion strategies; employer-focused training; high roads strategies; community career ladders; and skills standards.

Examining skills shortages in America's cities: Impact, city responses and business perspective.(2000).

This report documents the results of a survey of the principal cities of the United States conducted in 1999. The objective of this survey was to help determine the impact of the growing gap between the skills demanded by today's economy and the skills of the workforce, and how mayors and other city leaders, on behalf of their citizens, are addressing the skills gap. Officials in four out of five of the survey cities reported a shortage of highly skilled workers, and more than 77% said that this shortage had increased over the past 5 years. Survey cities indicated that their efforts to develop these skills among workers usually included partnerships involving, or programs conducted by, various local institutions, including colleges and universities, public postsecondary institutions, businesses, public elementary and secondary schools, and other institutions. Thirty-one percent of the officials reported that the state's Temporary Assistance for Needy Families program was taking advantage of newly granted flexibility to help move recipients from welfare to work. An appendix lists the 110 responding cities. (SLD)

Training for employment: Social inclusion, productivity, and youth employment. human resources training and development: Vocational guidance and vocational training. report V. international labour conference (88th session, 2000). fifth item on the agenda.(2000).

This report examines the human resources development and training dimensions of the gradual, but inexorable, shift towards knowledge-, skill-, and service-based economies and societies, and the stupendous growth of the information and communications technology sectors. Its four chapters explore the following: (1) globalization, technological change, and new organizations, including the development of new skills and competencies; (2) training for improved competitiveness, employability, and shared prosperity; (3) youth employment and training; and (4) training policy and system change, including governance, dialogue, and new partnerships. The report offers the following four conclusions: (1) all countries will feel the impact of these changes; (2) older, more mature economies

with skilled workers may resist change and suffer from a mismatch between skills and needs, and so need to stress education and training and make them more widely available in order to maintain employability and productivity over a lifetime; (3) in developing countries, more workers need to be educated so that they are not forced into unemployment, and young workers are most likely to benefit from training programs undertaken in a well-established institutional context; and (4) in all countries, major structural reforms are needed to adapt training continuously to the changing nature and dynamics of labor markets and to improve access to training for everybody throughout life. The report raises points for discussion of the role of human resources development in all types of economies.

Workforce training. Supply, demand, and gaps.(1998).

A study identified the gaps between supply and demand for training in Washington State and recommended strategies for reducing them. The study considered the perspectives of both employers and workers and separately analyzed the needs of three groups: youth, adults, and adults with barriers to employment. The study found the following: (1) there is a shortage of skilled workers that has been getting worse, with the most severe shortage being of workers with a postsecondary vocational diploma or certificate; (2) the shortage of skilled labor is affecting the state's opportunity for further economic growth; (3) there is also a gap in meeting employer and worker demand for upgrading current workers' skills; (4) although there are more than 250,000 economically disadvantaged adults in Washington State, only about one-third of them receive some training or postsecondary education during a year; (5) at least 200,000 Washington adults are deficient at the most basic skill levels; and (6) only 10 percent of employers provide even 4 hours of basic skills instruction per year. The following strategies to reduce the gaps in needed skills and trained workers were identified: continuing education reform, especially school-to-work transition, and vocational education; increasing the availability of secondary and postsecondary vocational-technical education; compressing adult vocational training; funding customized training linked to specific job openings; creating one-stop career centers; increasing training through the Job Training Partnership Act for adults who need basic skills; integrating basic skills with work and vocational training; and adding basic skills training in community and technical colleges.

Evaluating the 1995 BLS projections.(1997). *Monthly Labor Review, 120,* 3-31.

Education for employment.(1992). Educational Leadership, 49, 6-59+.

A world class workforce for Wisconsin. Governor's commission for a quality workforce. Executive summary. Technical findings. recommendations.(1991).

The skill needs of 3,500 Wisconsin employers were surveyed by mail (1,850 usable returns) and by telephone those of 102 of these employers (93 percent response). Findings included the following: (1) most employers face an increasing shortage of skilled workers; (2) employees tend to be deficient in basic skills; (3) employers are striving for continuous improvement; (4) 57 percent of Wisconsin employers have some involvement with education; (5) about 20 percent of Wisconsin businesses are

"best practice firms"; and (6) employers emphasize strengthening basic skills at every level and strengthening technical skills at technical colleges. The following recommendations were made: (1) more Wisconsin employers must adopt new technologies; (2) technical colleges must upgrade offerings to meet employers' needs; (3) technical colleges must work with employers to improve access to training; (4) public education must adopt outcome-oriented, competency-based educational objectives; (5) a Certificate of Initial Mastery should be a prerequisite for employment or training for high school students; (6) technical colleges and high schools must improve alternative education to prevent dropout; (7) high school curricula must be redesigned to prepare noncollege-bound students for technical careers; (8) high school counselors must work with employers to improve the school-to-work transition for noncollege-bound students; and (9) educators and counselors must improve career education. (Appended to the technical findings are the survey form and responses, a list of Wisconsin counties, and 13 references.)

Alssid, J. L., Gruber, D., Jenkins, D., Mazzeo, C., Roberts, B., & Stanback-Stroud, R. (2002). Building a career pathways system: Promising practices in community college-centered workforce development.

This report follows an initial study that identified evolving best practices in workforce development. The prior study defined three themes that reflect a developing consensus among policymakers and researchers and point to the opportunities for a career pathways model. These themes included: (1) individuals need some form of postsecondary education and training in order to become financially self-sufficient for the long-term future; (2) the nation's community colleges are in a position to help provide disadvantaged individuals with the skills and education they need to alleviate poverty; and (3) a workforce development system can help individuals find employment by becoming the skilled workers demanded by employers. This report identifies problems in developing effective models for workforce education, including lack of resources, interests, and coordination. The report also details, through case studies and policy review, how to accomplish the goals of workforce preparation and education in the form of community college programs, community and regional partnerships, and state policy. Recommendations are presented for community college-level administrators, community and regional-level policymakers, state administrators, community college system policymakers, and California institutions.

Atkinson, R. C. (1990). Supply and demand for scientists and engineers: A national crisis in the making. *Science, 248*(4954), 425-432.

Projections are analyzed for the future supply and demand of scientists and engineers. The demographics of the college-age population combined with estimates of the percentage of students who will pursue careers in science and engineering indicate significant shortfalls between the supply and demand for the next several decades.

Bailey, T. (1991). Jobs of the future and the education they will require: Evidence from occupational forecasts. *Educational Researcher, 20*, 11-20.

Bengtsson, J. (1993). Labour markets of the future: The challenge to education policy makers. *European Journal of Education, 28*(2), 135-157.

Bird, R., & Others. (1985). The dynamics of the teacher labor market in the southeast. selected monographs in educational policy research, number 3.
This monograph on teacher labor market research is divided into six major sections. The first, a survey of related literature, describes the general context of teacher labor market research derived from the educational reform movement and then focuses on the particular issues of supply adequacy, teacher quality, career choice, attrition, and compensation. Following the literature survey, four sections summarize the results of research under four major topic areas: (1) supply and demand monitoring and forecasting; (2) career choice and recruiting; (3) attrition; and (4) compensation. Individual research project components are discussed as subheadings under each major topic. The final section is a synthesis of the findings of the various research components which includes a discussion of policy implications and a summary of future research needs. Fourteen pages of references conclude the report.

Bishop, J. (1992). Is a skills shortage coming? Review of BLS occupational projections. Draft.
The Bureau of Labor Statistics (BLS) projections of occupational employment growth have consistently underpredicted the growth of skilled occupations. BLS currently predicts that professional, technical, and managerial jobs will account for 40.9 percent of employment growth between 1990 and 2005. Forecasting regressions predict these occupations will account for 53 to 68 percent of employment growth through 2005. Between 1986 and 1991, these occupations accounted, in fact, for 64 percent of employment growth. The BLS's projections of the supply/demand balance for college graduates have also been off the mark--predicting a surplus for the 1980s, when, in fact, a shortage developed and relative wage ratios for college graduates rose to all time highs. A slowdown in the growth of college educated workers during the 1990s and a continuing escalation of wage premiums for college graduates are projected. The social returns to a college education are extremely high and are likely to go even higher. Public policy should not attempt to discourage the shift of students into engineering and business, since the market will be able to absorb even larger numbers of graduates in these areas without significant trouble. Public policy should facilitate this process by focusing special effort on improving mathematics, science, and economics instruction. In making occupational forecasts BLS should do the following: use data on trends in industry-specific occupational staffing ratios to extrapolate staffing pattern changes; be less judgmental in projecting staffing ratios; develop shorter (5-year) forecasts; and examine why forecasts were inaccurate. Presentation of projections should include the following: identification of methodological changes made; alternative scenarios; no listing of occupations with the largest forecasted growth; and information on growth in wages and employment in each occupation. (Contains 37 references.) (YLB)

Bishop, J. H., & Carter, S. (1990). The deskilling vs. Upskilling debate: The role of BLS projections. Working paper # 90-14.

The accuracy of Bureau of Labor Statistics (BLS) projections of occupational employment growth was investigated for the period 1972-1989. BLS was found to have consistently underpredicted the growth of skilled occupations and overpredicted the growth of occupations requiring low or moderate skills. A regression-based forecast was indicated as doing a better job of forecasting future occupational staffing ratios than the judgmental approach used by BLS. A regression analysis of the substantial changes in occupational shares that occurred from 1972 to 1989 predicted substantially greater upskilling than BLS. BLS's projections of the supply/demand balance for college graduates were also evaluated and found to have been consistently wrong. An examination of this balance was done by comparing past and projected percentage rates of change in employment in high skill jobs to actual and projected percentage rates of change in the stock of well-educated workers. Projections indicated that the labor market for college graduates was tight and would get even tighter. Findings implied high social returns to a college education and the need for a public policy response to ameliorate the shortage.

Bishop, J. H., & Carter, S. (1990). *The worsening shortage of college graduate workers. working paper #90-15*. U.S.; New York:
U.S. Bureau of Labor Statistics (BLS) projections of occupational employment growth have systematically underpredicted the growth of occupations that require the most education and training. The latest data on occupational growth rates show that the BLS's recent projections of occupational employment growth to the year 2000 probably suffer from the same bias. Based on a regression analysis of trends in occupational shares, forecasts of occupational employment demand imply substantially faster growth of higher level occupations. A comparison of past and projected percentage rates of change in employment in high skill jobs to actual and projected rates of change in the stock of well-educated workers illustrates the supply/demand balance for college graduates. Findings show that, during the 1980s, employment in high skill occupations grew at nearly the same rate as the stock of workers with one or more years of college; employers wished to increase the proportion of workers in these ocupations who had a college education. A shortage developed and the wage premium for college graduates rose to unprecedented levels. Policy implications include the following: (1) the social returns to a college education are extremely high and likely to go higher; (2) continuing inequality in wage premiums will put U.S. corporations at a competitive disadvantage; and (3) public policy must focus on increasing the supply of technically and scientifically trained individuals.

Bosworth, B. (1997). Economic development, workforce development, and the urban community college. *Community College Journal, 67*, 8-13.
Community colleges have the potential to contribute significantly to solving the workforce and economic development problems facing urban metropolitan regions by employing new strategies. Community colleges are leading the reform of enabling the demand side of the labor market--the employers--to become the driving factor in shaping job preparation and employment services. However, community colleges must quicken their pace and assert even more leadership. They must

improve their ability to work directly with employers in the effort to invent and refine new strategies for demand-driven workforce development. These new approaches to training mean that colleges will act chiefly as organizers or brokers of training rather than simply as traditional providers.

Bragg, D. D. (2001). Opportunities and challenges for the new vocationalism in American community colleges. *New Directions for Community Colleges*, (115), 5-15.
Part of a special issue on the new vocationalism in community colleges. The new vocationalism is playing an important role in community colleges. It emphasizes career clusters or pathways in fields that are integral to the new economy, takes into account that understanding the changing nature of work is important for understanding the need to enhance the vocational curriculum, is deeply rooted in an effort to better integrate vocational education in K-16 education and economic and social structures, means that more students can benefit from vocational education, and encourages constructivist theories, learner-centered and project-based instructional approaches, and active teaching strategies. Initiatives that highlight reform in vocational education are tech prep, work-based learning, articulated vocational education and applied baccalaureate degree programs, certification, and contract and customized training. Other aspects of the new vocationalism are discussed.

Brown, B. L. (2003). *Connecting CTE to labor market information. practice application brief* No. No28). U.S.; Ohio:
The use of up-to-date labor market information (LMI) provided by a variety of state, federal, and local agencies and organizations can help program planners and policy makers design effective career and technical education (CTE) programs to prepare students for occupations and careers in demand. LMI includes information about labor market conditions, employment trends, earnings in occupations, skill requirements, and education and training resources that offers insights about economic trends that have implications for employment. CTE program planners can use such LMI to ensure that they accomplish the following: develop occupational standards that reflect changing socioeconomic demands; ensure that CTE programs contain current and relevant workplace information; and facilitate individual career decision making. Four ways that program planners can use LMI to coordinate services, be cost effective, meet quality requirements, and show evidence of success are as follows: link academic and occupational skills standards to career development; use multiple sources of LMI; refer students to high-quality information resources; and link career information with assessment tools.

Buzzell, C. H. (1989). Future work force needs: Finding the hidden truth. *School Shop, 48*, 22-24.

Capilouto, E., & Others. (1995). A review of methods used to project the future supply of dental personnel and the future demand and need for dental services. *Journal of Dental Education, 59*(1), 237-257.

Econometric, supply, and manpower models adopted to forecast need and demand for dental services personnel are examined critically, based in part on the models' past success in prediction. Areas of concern and conditions not reflected in the models are noted. All the models are seen to be limited.

Christiadi, Loveridge, S. (2000). A comparison of survey and non-survey methods for estimating county-level demand for educational attainment. research paper 2021.
The Workforce Investment Act of 1998 shifts decision-making authority for funding of local job training programs from the federal government to state and local boards, which will need local decision-making tools to inform policy. One such tool is a method proposed by S. Goetz and D. Debertin to estimate demand for educational attainment at the county level utilizing nonlocal secondary data on employment patterns. The method focuses analysis on the demand of private businesses and makes possible a simple forecast of future demand. This paper estimates local demand for educational attainment in two West Virginia counties using the Goetz-Debertin (nonsurvey) method and compares results with those from a survey of local businesses. Two assumptions of the nonsurvey method are fixed proportions of occupations per sector and fixed proportions of educational attainment per occupation. Results indicate that differences in the distribution of businesses by size and by subsector across counties might affect final demand, but the nonsurvey method does not take this into account. Indications that proportions of input might change over time suggest that the nonsurvey method should use annual data sets such as the Current Population Survey. Conflicting with the nonsurvey method's second assumption is the finding that certain occupations in different sectors differ in demand for educational attainment. The study also found that the West Virginia counties' proportion of top-level occupations was substantially below national averages, suggesting underinvestment in education, and that businesses saw a real need for more computer training.

Conklin, K., & Reindl, T. (2004). To keep America competitive, states and colleges must work together. *The Chronicle of Higher Education, 50*(23),B20.
Instead of arguing over tight budgets, government and college leaders need to collaborate to educate and train a labor force with the skills required for the U.S. to compete in a global market. Some ways in which the government and college leaders can address the gap between institutional requirements and available resources are suggested.

Crockett, L. L. (2001). Facing the challenges of a changing labor market. *Techniques (Association for Career and Technical Education), 76*(2), 30-33.
Education and job skills training programs and training providers are meeting the challenges of a changing labor market. Programs that are critical to employee recruitment, retention, satisfaction, and advancement include New York's Education for Gainful Employment, Virginia's employment and training program, Colorado's Jobs for Progress program, the programs of Minnesota's Employment Action Center, the Greater Chicago Food Depository's Community Kitchens program, and California's Opportunities Industrialization Center West. In addition, several

nonprofit organizations provide training, resources, research, and assessment in most trades. These include the National Center for Construction Education and Research, ACT Inc., and the Institute for Women in Trades, Technology & Science.

Davenport, L. F. (1989). The role of the community college in meeting America's future labor force needs. *Community, Technical, and Junior College Journal, 59*, 23-27.

Desmarez, P., & Thys-Clement, F. (1994). Universities, students and employment: Present position and prospects. *Higher Education Management, 6*(3), 259-273.
This article examines the role of universities as training institutions for industry, presents a critical review of assumptions about skills shortages, and urges universities to become involved in continuing education to updated skills of employees while ensuring that their neutral image and their focus on broad education in the humanities continues.

Dohm, A., & Wyatt, I. (2002). College at work: Outlook and earnings for college graduates, 2000-10. *Occupational Outlook Quarterly, 46*(3), 2-15.
The writers discusses the job prospects for college graduates during the era 2000-10. They examine education and employment data, reasons for attending college, and earnings data. They describe the background for the Bureau of Labor Statistics publication of the outlook for college graduates, including information about why this article differs markedly from those of years past. They also project the number of job openings in occupations that employ the largest numbers of college graduates and compare growth in these jobs with the projected average employment growth for all occupations. Sources for further research are discussed.

Eisen, P. (2005). Community colleges critical to manufacturing's future. *Community College Journal, 75*(6), 46-47.
Kansas City's Dream It. Do It. campaign was launched recently with the aim of encouraging the local community to work together to foster development and robust growth by preparing a technology competent, high skilled manufacturing workforce. The campaign is based on the belief that the goal of making manufacturing a preferred career choice by 2010 can be achieved by tapping into the passions and dreams of young people and then connecting them to the outstanding career opportunities in manufacturing.

Emmerij, L. (1987). Intervening on the supply side of the labor market. *The Annals of the American Academy of Political and Social Science, 492*, 159-170.

Erekson, T. L., & Gloeckner, G. (1986). Supply and demand of university faculty. *Industrial Education, 75*(9), 8-10.
A study was conducted to collect employment-related data for current university industrial education faculty that could be analyzed by teaching area. The intent was to determine the age distribution data by teaching area as a basis for making labor market demand projections. Results indicated a potential shortage of industrial education faculty in the near future.

Fawson, C., & Criddle, K. R. (1994). A comparative analysis of time series approaches to modeling intersectoral and intercounty employment linkages in rural regional labor markets. *Journal of Regional Science, 34*, 57-74.

Finn, M. G. (1989). *Trends in science and engineering education and the U.S. labor market. background paper no. 3*. U.S.; District of Columbia:
A search of literature was conducted to address whether and how the Federal Government should do more to encourage U.S. students to complete degrees, especially graduate degrees, in science and engineering. Science was defined to include all of natural science, including mathematics and computer science, but to exclude social and behavioral sciences. The study found that the number of U.S. citizens earning doctorates in science and engineering in 1987 was 9,724. This number is not enough to replace scientists and engineers who die or retire, but the number is greatly augmented by foreign residents who receive doctorates and remain in the United States. The level of science and engineering doctorate awards to U.S. citizens has been constant since 1976. Until now, the number of degrees awarded has usually been sufficient to meet employment needs, with the labor market expanding and contracting and student enrollments following suit, after a lag. However, although shortages are not widespread at present, there are general persistent shortages of personnel in computer science and engineering, and sometimes in mathematics and environmental and physical sciences. Federal intervention in the science and engineering job market can be made through graduate fellowships and traineeships, research assistanceships, forgivable loans, precollege programs, tax incentives, undergraduate assistance, and employee educational assistance, but such intervention has both pros and cons.

Forde, M. L. (2002). Community colleges--the center of the workforce development universe. *Community College Journal, 72*(6), 32-35.
Community colleges are at the core of the workforce and economic development world. Being less than a decade in this position, community colleges are making significant strides in helping individuals to move from various levels of educational preparedness and attainment to college completion and to lucrative jobs and are having a remarkable effect on economic development nationwide. Community colleges' maintenance of their position requires meaningful communication with internal and external stakeholders, talented and committed individuals at the core, and an ongoing search for new talent and new alliances.

Friedel, J. N. (1988). Labor market assessments: Academic and administrative planning. *Planning for Higher Education, 17*(4), 27-32.

Fullerton, H. N. J. (1988). An evaluation of labor force projections to 1985. *Monthly Labor Review, 111*, 7-17.

Gennett, N. D., Johnston, C. W., & Wilson, M. A. (2001). The shift to workforce development. *Community College Journal, 71*(5), 60-63.
Central Piedmont Community College in Charlotte, North Carolina, has found it

possible to successfully combine workforce development with its traditional community college mission. This institution's close alliance with local employers has ensured the availability of relevant employment training services and traditional opportunities for college transfer education to all local citizens, as appropriate to their type and level of need.

Goldstein, H. A., & Cruze, A. M. (1987). An evaluation of state projections of industry, occupational employment. *Monthly Labor Review, 110*, 29-38.

Grubb, W. N. (2001). From isolation to integration: Postsecondary vocational education and emerging systems of workforce development. *New Directions for Community Colleges*, (115), 27-37.
Part of a special issue on the new vocationalism in community colleges. A summary of research on efforts to create more effective and coherent systems of workforce preparation is presented. The research was conducted at the former National Center for Research in Vocational Education at the University of California, Berkeley. The research addresses the elaboration of workforce development programs, complaints about the existing systems, workshop development programs in the states, the role of the federal government, and the potential role of postsecondary vocational education in workforce development systems. The research suggests that education providers can develop integrated systems that benefit students and employers by targeting programs on the most promising job opportunities.

Harmon, R., & MacAllum, K. (2003). *Documented characteristics of labor market-responsive community colleges and a review of supporting literature*. U.S.; District of Columbia:
This paper discusses the mission of the market-responsive community college. These colleges include mid- and high-level workforce training in their curriculum. Some of the characteristics of a market-responsive community college detailed here include: (1) allocating resources to develop training programs; (2) reaching out to businesses and other organizations; (3) responding rapidly to changes in local economic conditions and training needs; (4) recruiting faculty from among local experts in the field; and (5) partnering with other local educational institutions to deliver comprehensive training. Over 200 publications were reviewed for this report, and the 25 articles that contained the most relevant information, including descriptions of labor-market responsive behavior, were selected. The four methodologies used in preparing the articles that were selected were: (1) statistical analysis; (2) less formal data analysis; (3) literature reviews; and (4) anecdotal evidence. The conclusions of this review will be used as hypotheses to be thoroughly tested in the next phase of this initiative. A reading of the literature found that outsourced training expenditures for U.S. companies nearly doubled, from $9.9 billion to $19.3 billion annually, between 1994 and 2000. Includes brief outlines of specific community college programs and 25 annotated references to literature analyzed for the study.

Holden, C. (1989). Wanted: 675,000 future scientists and engineers. *Science, 244*(4912), 1536-1537.
Presented are employment projections in science and engineering. A shortfall is predicted unless more women and minorities can be attracted to science. Projections are based on a number of demographic and educational statistics. (CW)

Kirwan, W. E. (1990). Meeting the mathematical needs of our nation's work force. *Educational Horizons, 69*, 22-27.

Kotamraju, P., Steuernagel, B., & Jacquart, M. (2002). *New program development strategy and Supply/Demand analysis: The relationship between postsecondary degree program outcomes and occupational needs in Minnesota*. U.S.; Minnesota:
This five-section paper describes how the Minnesota State Colleges and Universities (MnSCU) system, the largest system of higher education in the state, determines what degree programs will be created, based on needs for workers in various occupations in the state. The paper begins by discussing why connecting demographic trends, learner segments, and labor market information become crucial not only in helping to decide which new program ideas to implement, but also to assist in balancing the competing demands for a regional and statewide new program development strategy. The next section of the paper describes briefly a potential new program approval process that considers a supply and demand analysis in the approval of new program ideas solicited from MnSCU institutions. By refining the supply and demand analysis described in Appendix B, a more precise estimate for the total number of additional graduates that would potentially result from implementing the new program approval process is also estimated. The last two sections provide preliminary results from the analysis, and conclusions and implications are drawn about why MnSCU in particular, but all postsecondary institutions in general, must understand how labor market information could contribute to mediating the conflicting and competing interests of stakeholders in the area of new program development strategies. MnSCU serves 225,000 students annually in credit courses and nearly 95,000 students in non-credit courses. The system includes 7 state universities and 27 community, technical, and consolidated colleges located on 53 campuses across Minnesota.

Kutscher, R. E., & Others. (1992). Outlook 1990-2005: Major trends and issues ⋀ the 1990-2005 job outlook in brief. *Occupational Outlook Quarterly, 36*(1), 2-11.
In next 15 years, economy will grow more slowly than it did in 1980s because of slow growth in labor force. Service industry will provide most of new jobs, and higher educational attainment will be needed to enable people to compete in an increasingly diverse labor force. (Includes projections and expected competition for about 250 occupations.)

Lefberg, I., & Others. (1996). Long-term economic and labor forecast trends for washington. 1996.
This publication provides actual historical and long-term forecast data on labor force, total wage and salary employment, industry employment, and personal income

for the state of Washington. The data are based upon the Washington Office of Financial Management long-term population forecast. Chapter 1 presents long-term forecasts of Washington population and net migration. Chapter 2 offers long-term forecasts of the Washington labor force including effects of population growth, migration, changes in labor force participation, the "new labor force," and challenges of the changing labor force. Chapter 3 provides the long-term forecast of Washington wage and salary employment broken down by specific areas for goods producing employment (such as lumber, paper, and aerospace) and non-goods producing employment (such as trade, services, and government). Chapter 4 provides the long-term forecast of Washington per capita personal income. Chapter 5 is a special report on changes in real average earnings in Washington which provides an analysis of data from 1979 through 1994. Chapter 6 is a special report on earnings differences, including differences by education, among Washington workers, noting a decline in average earnings and a greater inequality in earnings. A total of 26 figures and 12 tables detail the statistical data supporting the narrative analysis.

LeSage, J. P. (1990). Forecasting metropolitan employment using an export-base error-correction model. *Journal of Regional Science, 30*, 307-323.

LeSage, J. P. (1990). Forecasting turning points in metropolitan employment growth rates using bayesian techniques. *Journal of Regional Science, 30*, 533-548.

Maryland State Higher Education Commission, Annapolis. (1996). *A study of the workforce needs of Maryland employers*. U.S.; Maryland:
The Maryland Higher Education Commission surveyed more than 2,500 employers in the state to learn what programs at various degree levels were desired by employers. The results were examined along with labor market data about the projected number of job openings in specific occupational areas. It was concluded that nearly 60 percent of job openings in Maryland through the year 2005 will require some form of education or training beyond high school and nearly one-third of all job openings will require a two- or four-year college degree with approximately 26,000 Maryland job openings each year through 2005 requiring a college degree. General managers and registered nurses are projected to represent the largest number of job openings. Other occupations projected to have a large number of vacancies are bankers, sales workers, accountants, physicians, computer programmers, food/lodging managers, teachers and college faculty, electronic data processors, and electrical engineers. Certificate and degree programs most frequently named as not producing adequate numbers of qualified graduates were the health professions and business management. The highest demand bachelor's degrees were in business, the health professions, engineering, and computer science with a similar demand for master's and doctoral degrees. Tables include demand by region and county. The survey form and list of employers who responded are appended.

Office of Technology Policy (DOC), Washington, DC. (1998). *Very rapid increase in demand for core information technology workers projected for the 1996-2006 period. America's new deficit: Update*. U.S.; District of Columbia:

The Office of Technology has analyzed Bureau of Labor Statistics's (BLS's) growth projections for the three core occupational classifications of information technology (IT) workers--computer scientists and engineers, systems analysts, and computer programmers--to assess future United States demand. BLS projections indicate that between 1996-2006, the U.S. will require more than 1.3 million new IT workers in these 3 occupations to fill newly created jobs and to replace workers who are leaving these fields. Of the 3 occupations, the largest growth in jobs is accounted for by systems analysts, with a projected increase of 103 percent compared to 14 percent for all occupations. The number of computer engineers and scientists is expected to grow by 114 percent, while the number of computer programmer positions is expected to grow at a slower rate of 23 percent. The service sector is expected to absorb the lion's share of all increases in core IT occupations. Certain industries are more IT worker intensive than others and would be more affected by tight IT labor markets. These markets are growing in their IT worker intensity. When IT worker intensity and size of IT workforce are taken together, the computer and data processing services industry stands out starkly as an industry with much at stake in the supply of IT workers. (Five figures and a list of facts about America's IT workforce are included.) (

Patterson, V. (1996). Industry and education collaborate to shape future workers. *Journal of Career Planning & Employment, 56*, 28-30+.

The writer discusses how undergraduate education is being redesigned with the help of employers. Long-standing relationships exist in the U.S. between many large corporations and universities. Corporations are involved in collaborative projects to foster long-term positive benefits for all who participate in the cycle of education. In particular, they wish to reform undergraduate education and to ensure that industry will be able to recruit new graduates who possess the necessary knowledge for engineering, design, and manufacturing settings. Each coalition has industry partners who donate money, time, and their employees' expertise. This approach to undergraduate engineering education has created changes in the way some universities produce engineers. Not only does industry benefit from coalition efforts, but benefits are also accrued by students and graduates who are more prepared for their first jobs in industry and the world of employment.

Pelham, W. D. (2001). Technical scholars: A three-way partnership for career development. *Community College Journal of Research and Practice, 25*(10), 783-791.

The Technical Scholars Program in Spartanburg, South Carolina, was established in the early 1980s to address the lack of trained technicians available for work in key manufacturing industries. The program is based on a three-way partnership between the student, the employer, and Spartanburg Technical College. Students receive full scholarships and obtain valuable work experience, while employers are provided with well-trained employees who are ready to be productive if they join the company on a permanent basis. In addition, the program provides the college with an excellent way of supporting its students and allows it to develop very close working relationships with area companies. Since the first class of Technical Scholars began

in 1982, over 100 graduates have benefited from the vision of the community leaders who identified a need and filled that need with the Technical Scholars Program.

Pool, R. (1990). Who will do science in the 1990s? *Science, 248*(4954), 433-435.
Provided are projections for the scientific job market in the 1990s. Predicted are increases in the numbers of engineering positions above the rate of growth for all other occupations. The status and outlook for minority groups are highlighted.

Rosenthal, D., & Collier, K. (1999). *Employment projections and program priorities. AIR 1999 annual forum paper*. U.S.; Alabama:
This study compared occupational projections for Alabama with graduation rates in corresponding academic programs to provide a context for state and institutional policy decisions on new program initiatives and to comply with recent program viability legislation. The study examined number of degrees conferred, employment projections, and application of crosswalk data analysis to relate the two. Data on completed degrees were from the Integrated Post-Secondary Education Data System; employment projections based on Bureau of Labor Statistics data; and crosswalk data from the National Crosswalk Data Center. Application of the model yielded the general conclusion that existing programs in Alabama colleges and universities will probably meet the demand for most fast growing and high demand occupations requiring a baccalaureate degree through the year 2006. Among occupations where the supply is projected to meet or exceed demand are executives, registered nurses, elementary teachers, and accountants. Occupations where the supply may not meet demand include system analysts, special education teachers, operations research analysts, and computer engineers. Results suggest these data could be used for planning purposes, to aid in decision making, and as a catalyst for collaborative initiatives.

Rosenthal, N. H. (1999). The quality of BLS projections: A historical account. *Monthly Labor Review, 122*(5), 27-35.

Rosenthal, N. H. (1992). 1982-83 edition: How accurate were the projections? *Occupational Outlook Quarterly, 36*, 24-32.
An evaluation of the accuracy of the Occupational Outlook Handbook from 1980 through 1990 reveals that most of the book's projections during this period were on target. The Occupational Outlook Handbook, which is used by millions of people in planning their careers, provides estimates of employment growth in numerous fields and information about educational requirements, working conditions, and the nature of the work in specific occupations. The writer discusses how the projections are developed, criteria for evaluation, comparisons of projected growth and actual growth, and the reasons for the failures of some descriptors. Tables indicate the accuracy of employment growth descriptors used in the 1982-83 Occupational Outlook Handbook for selected occupations.

Saunders, N. C. (1992). BLS employment projections for 1990: An evaluation. *Monthly Labor Review, 115*, 15-31.

Schuster, J. H. (1995). Whither the faculty? the changing academic labor market. *Educational Record, 76*(4), 28-33.
Factors affecting the college faculty labor market now and in the future are examined, including the difficulties of forecasting teacher demand through enrollments and faculty turnover, economic and political conditions, the end of mandatory retirement, immigration issues, need for staffing flexibility, and emerging technology. Early attention to policies in anticipation of changing conditions is recommended.

Sommers, P., & Heg, D. (2000). Matching community and technical college Professional/Technical education capacity to employer demand. final report.
A project was conducted to improve the state of Washington's community and technical college system by developing and using an improved occupational forecasting system to assess and respond to education and training needs. First, long-term occupational forecast data from Washington's Employment Security Department were matched with technical and community college program completion numbers to identify occupations where employer-identified labor needs were not being met or where oversupplies of workers existed. Next, the assessment results were verified through extensive employer interviews focusing on occupational demand, wages, skill requirements, hiring processes, and preferred forms of education/training. The forecasting system was used to assess labor needs in the following occupational areas: information technology; human services; purchasing and logistics management; automotive technicians; machine trades; and agriculture/agribusiness. The following were among the recommendations issued: (1) have college staff conduct regular labor market analyses; (2) develop more flexible service delivery systems; and (3) make a state-level policy commitment to direct colleges to respond to evidence of excess supply or demand by modifying the number of slots in particular programs. (The occupational assessment interview guide is appended, along with the labor market assessment reports for the fields of automotive technology and purchasing and logistics management technology.)

Stapleton, D. C. (1989). Cohort size and the academic labor market. *Journal of Human Resources, 24*(2), 221-252.
Argues that policymakers should be skeptical of forecasts that predict faculty shortages and surpluses according to population trends and analyzes an economic model of the academic labor market. Concludes that forecasts from such models do not support policies designed to offset the impact of cohort size on the academic labor market.

Sweeney, S. H. (2004). Regional occupational employment projections: Modeling supply constraints in the direct-requirements approach. *Journal of Regional Science, 44*(2), 263-288.

Turner, S. E. (2002). Connecting higher education and the labor market. *Change, 34*(4), 32-39.
One justification for state investment in college and university education is that

states enjoy the returns of such investments in the form of a more able workforce. Conventional arguments suggest that the more highly educated a given workforce is, the more productive it is likely to be. Given the mobility of the labor force, however, there may be little correlation between the number of baccalaureate degrees produced by a given state and the number of college graduates living there. The findings are presented of a study that suggests that increasing the degree output of colleges and universities in a state will have a modest influence on its long-term concentration of college-educated workers, and the implications of these findings are examined.

Van Adams, A., & Others. (1992). Market-based manpower planning with labour market signals. *International Labour Review, 131*(3), 261-279.
Labor market planning techniques must take into account the dynamic nature of economies. A better approach than labor needs forecasting is use of labor market signals developed by monitoring wage and employment changes and evaluating training programs.

Wainwright, W. S. (2004). Practices and procedures guiding workforce development initiatives in one Louisiana technical college region. *Community College Journal of Research and Practice, 28*(6), 525-534.
Part of a special issue on the emerging Louisiana Community and Technical College System. A study examined the institutional infrastructure for providing workforce training and continuing education at eight campuses in the Louisiana Technical College Greater Baton Rouge/Northshore District II Service Delivery Area. Findings revealed that although all campuses in the district tried to respond to the customized training needs of business and industry, only a few of the campuses were adequately equipped, staffed, and supported by an effective infrastructure dedicated to the delivery of high quality workforce training.

Walker, D. M. (2001). Human capital: Building the information technology workforce to achieve results. testimony before the subcommittee on technology and procurement policy, committee on government reform, U.S. house of representatives.
The Comptroller General of the United States testified before Congress regarding the General Accounting Office's (GAO's) framework for building the information technology (IT) work force to achieve results. The following were among the key points of his testimony: (1) the federal government is facing pervasive human capital challenges that are eroding the ability of many agencies to perform their missions economically, efficiently, and effectively; (2) many parties, including the President, federal department and agency leaders, Congress, the private sector, and academia, will need to work to address the government's human capital problem; (3) human capital issues are having a particular bearing on the IT area inasmuch as the federal government's ability to acquire and use IT successfully will hinge on its ability to build, prepare, and manage its IT work force; and (4) federal agencies must overcome these two basic challenges related to IT human capital: a shortage of skilled workers and the need to provide a broad range of related staff training and development. (The following items are appended: the GAO's human capital

framework; examples of federal agencies with human capital challenges; and a list of the responsibilities of selected agencies/organizations and sectors for the addressing human capital challenges.)

Wallhaus, R. A. (1996). The roles of postsecondary education in workforce development: Challenges for state policy.
This paper provides an overview of the issues and challenges facing postsecondary education in workforce development in the states. Key questions of employer, learner, and government and public expectations are listed as a suggested starting point for discussions between state, education, and business leaders about strategies for addressing these challenges. Employers, learners, and the public are seen as placing increasing demands and expectations on colleges and universities to do a better job preparing the workforce. The role of higher education in workforce development is examined, using employer, learner, and public expectations as a basis; the kinds of responses that colleges and universities must offer in return are addressed. Employers are placing increasing demand for basic education skills, such as in mathematics and communication, and basic workplace skills, such as teamworking, interpersonal relations, and leadership. Expectations of learners are aligning themselves with the employer needs, especially among older, non-traditional students. As learners and employers seek more flexibility and access to education and training, institutions must respond with new instructional delivery systems, including teacher preparation and professional development, based on public need and demand. Coordination across federal, state, and public needs is the key to an effective workforce development system and the changes that this will bring to the current educational systems.

Warford, L. J., & Flynn, W. J. (2000). New game, new rules: Strategic positioning for workforce development. *Community College Journal, 70*(4), 30-33.
Advice for community colleges on developing a strategic approach to dealing with emerging workforce development legislation is presented. The advice focuses on analyzing the local workforce; identifying the four major workforce segments of the emerging worker, the transitional worker, the entrepreneur, and the incumbent worker; and matching these segments with the most suitable unit of the college to meet customer and stakeholder requirements and expectations.

Washington State Workforce Training and Education Coordinating Board, Olympia. (1998). *Progress of operating agencies in implementing "high skills, high wages," Washington's comprehensive plan for workforce training and education. A report to the legislature. July 1997-june 1998*. U.S.; Washington:
During 1997-98, state agencies in Washington worked to implement the state's High Skills, High Wages Plan for Workforce Training and Education, focusing on seven most urgently needed actions to ensure that the people of the state succeed in an economy that requires ever higher levels of skill and knowledge. Progress made on seven actions included the following: (1) an agency continuous improvement plan was made and impact evaluations of the Job Training Partnership Act, community colleges, and the work force training and education system were begun; (2) a worker

retraining program, job placement centers, one-stop career centers, and a labor market information system were established to increase system capacity; (3) school-to-work transition activities included recommending a certificate of mastery, initiating a multiyear evaluation, funding work-based learning (WBL) and teacher preparation projects, conducting research on career preparation standards and public awareness, participating in a national curriculum development initiative, and examining whether all student populations are being served; (4) college admission standards were revised and a WBL guide developed to improve integration of the work force training and education system; (5) website enhancements and publication dissemination increased public awareness of training and education issues and initiatives; (6) WorkFirst, a welfare reform initiative, was begun in collaboration with other state agencies; and (7) connections between workforce training/education and economic development were strengthened through a job skills program, manufacturing extension service, and a demonstration project on informal learning in the workplace.

Webber, P. B. (1994). National response to the nursing shortage: Implications for nursing education. *Journal of Nursing Education, 33*, 107-111.

References - Other Geographic Areas

Skill needs: Linking labour market analysis and vocational training. report.(1998). This publication contains workshop papers which discuss the link between the labor market and vocational training. Part I provides an overview of the workshop--its objectives, issues, and conclusions. Part II consists of seven country papers. "Labour Market Information (LMI) and Vocational Training Decision-Making in Hungary" (Lazar) outlines types of LMI to help vocational education and training (VET) planning and problems concerning LMI and its use for VET decision-making. "Labour Market Needs in Adult Training Programmes in Hungary" (Fodor) discusses the labor market training system and developing company-specific training programs. "Regional Employment and Training Observatory in France" (Guegnard, Perrier-Cornet) focuses on the observatory in Burgundy, an inter-institutional network. "New Methods for Linking VET with the Labour Market in Poland: The Results of a Pilot Application" (Kabaj) focuses on two methods: monitoring of shortage and surplus occupations and tripartite training agreements. "The Future of Skills and Work: Trends and Forecasts in Germany" (Tessaring) concludes that structural change in industry and society is accompanied by a major increase in the qualification requirements of the workforce. "Challenges of Incorporating Labour Market Requirements in the Vocational Training System: Slovenia" (Kramberger) provides a summary of broader processes that influence reform attempts to improve the VET system. "Linking Labour Market Analysis and Vocational Training in the United Kingdom" (Edgell) covers the sort of analysis undertaken at the national level. Part III has four discussion papers. "The Identification of Relevant LMI for VET" (Meijers) elaborates on the need for LMI in an industrial society and describes

a new qualification model. "Labour Market Forecasts on Behalf of the VET System" (de Grip) focuses on the kind of LMI required to improve the transparency of the labor market and reestablish coordination between the labor market and VET system in the former centrally planned economies of Central and Eastern Europe. "Qualitative Information for Curriculum Development" (Dybowski) discusses ways to ensure that curricula remain up-to-date. "Linking Labour Market Analysis to Vocational Training Decision-Making: Dynamics and Mechanisms" (Mozdzenska-Mrozek) presents emerging links between VET and the labor market, institutions collecting and shaping information on the labor market situation in Poland, and VET reform in Poland. Contributor notes are appended.

Aamodt, P. O., & Arnesen, C. A. (1995). The relationship between expansion in higher education and the labour market in norway. *European Journal of Education, 30*, 65-76.

Part of a special issue on higher education and employment in Europe. The writers discuss the relationship between educational expansion and the labor market in Norway. They describe quantitative growth in higher education and certain overall trends in the economy. They argue that the policy of expanding the capacity of higher education is being used as a buffer against youth unemployment and that, even if this policy succeeds in its aim of checking unemployment, it is unclear if it will benefit the economy in the long-term. Survey data on the transition from higher education to work are presented in order to illuminate changes in the labor market for graduates. The writers conclude by discussing whether a worsening labor market for graduates is the result of changes in the demand structure for educated manpower or whether it is due to the expansion of higher education.

Abrahart, A. (2000). Kazakhstan. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 138-57.

Abrahart, A., & Tzannatos, Z. (2000). Australia. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 465-84.

Beduwe, C., & Planas, J. (2004). The effects of educational expansion on the functioning of the labour market: Report of a comparative study. *Compare A Journal of Comparative Education, 34*(1), 53-71.

Societies are increasingly complex. Change is accelerating and its effects are unknown. Managing uncertainty is a major challenge, to the extent that in economics it is becoming difficult to assess need in terms of human capital requirements. This contrasts with the certainty that there is an increasing need for skills in the knowledge society and informational capitalism (Descy & Tessaring, 2002). Scientific and political thinkers alike agree on the necessity to develop, quantitatively and qualitatively, individual and collective skills to face the changing economy. Castells (1997, p. 58) claims that for the first time in history, the human mind has become a direct productive asset, rather than just a decisive production factor; its significance and productive value is also changed by its cultivation, through training in the broadest sense?. We have chosen to proceed in stages. The

dynamics of the education systems of the five countries and the way in which they model the qualifications structure of each generation have resulted in relations between education and employment that differ according to country. Analysing and comparing the educational dynamics that have prevailed for the last 40 years was the first stage of our research. We then studied the impact of these dynamics on access to employment by the generations concerned (position of graduates in the employment structure, professional position reached, associated salary) in order to measure the value granted to this additional education by the labour market and employers. Finally, a study of the recruitment practices and career management within enterprises allowed us to better understand the evolutions resulting from this expansion of education. From the results of the three stages we obtained the basic elements for a study on the future of our models of skill development.

Borghans, L., de Grip, A., & Heijke, H. (1996). Concepts and methodology for labour market forecasts by occupation and qualification in the context of a flexible labour market.

The problem of planning and making labor market forecasts by occupation and qualification in the context of a constantly changing labor market was examined. The examination focused on the following topics: assumptions, benefits, and pitfalls of the labor requirement model of projecting future imbalances between labor supply and demand for certain types of education or qualifications; considerations in interpreting educational and skill requirements for specific jobs; substitution processes resulting from discrepancies between demand and supply in the labor market; substitution processes in the labor market (opportunities to switch to jobs in other economic subsectors, opportunities for substitution in recruiting personnel, structure of the labor market, clearly demarcated market segments, large occupational submarkets, specialization and flexibility, and similarities between different levels of education); methods of modeling substitution processes; components of demand; and shifts in employment by educational levels. It was demonstrated by way of the example of the Dutch labor market that substitution processes between different types of education play a crucial role in the labor market's adjustment to changes in supply and demand.

Borghans, L., de Grip, A., & Heijke, H. (1996). Labor market information and the choice of vocational specialization. *Economics of Education Review, 15*(1), 59-74.

The choice of vocational specialization at school is often hampered by the need for labor market information which is not available. This article investigates whether students of the Dutch junior secondary technical schools anticipate future labor market situations. We try to answer this question by introducing two extreme models: the cobweb model and the rational expectations model. By using the estimation results, the extent of the information problem is measured, indicating large mismatches due to unanticipated changes in the labor market. These results suggest the importance of additional public labor market forecasts to assist students' choices.

Borghans, L., & Willems, E. (1998). Interpreting gaps in manpower forecasting models. *Labour, 12*(4), 633-41.
In manpower forecasting labour market developments are analysed in terms of shortages and surpluses. Such an approach seems to neglect the flexibility of the labour market, present in most economic labour market models. It is shown that an appropriate interpretation of gaps in manpower forecasting does not exclude a full functioning of the market clearing mechanism.

Braddock, D. (1999). Occupational employment projections to 2008. *Monthly Labor Review, 122*(11), 51-77.
This article discusses Bureau of Labor Statistics projections of changes in the structure of employment at the major occupational group level for the 1998-2008 period, along with the changes that occurred in the previous 10-year period, 1988-98. It identifies the detailed occupations that are projected to grow at the fastest rate, as well as those with the largest numerical increases and decreases, along with their current educational and training requirements and earnings. The total number of job openings projected to occur, net replacement needs, distribution of employment, and projected job openings are also discussed.

Brunello, G., & Ishikawa, T. (2001). Education, training and labour market structure. *Comparing Economic Systems: Italy and Japan*, 198-220.

Burns, M., & Shanahan, M. (2000). Labour market models and their use in projecting vocational education and training requirements.
This report focuses on use of large-scale economy-wide models in Australia for occupational forecasting and their use in the vocational education and training (VET) sector for making decisions about training profiles across occupational areas. Section 2 reviews objectives of VET policy as defined in the legislation and Australian National Training Authority annual reports. Section 3 provides a non-technical overview of international perspectives on the role of occupational forecasting in VET planning and identifies informational requirements of VET planning. Section 4 reports the views and practices of personnel in the VET sector relating to use of labor market projections. Section 5 discusses economic modeling, including the: nature of economic models, constructions of models, different types of economic models, model uses and limitations, and implications of VET requirements for model design and structure. Section 6 describes development of major economic models; reviews research of comparative model evaluation; describes major recent developments in the Monash and Murphy modeling capability; examines the National Institute of Economic and Industry Research model, modern multi-country general equilibrium models, and the latest modeling methodologies used for occupational forecasting overseas; and examines strengths and weaknesses of these approaches; and analyzes how they are used in the VET sector.

Campbell, C. P. (1997). Workforce requirements: The basis for relevant occupational training. *Journal of European Industrial Training, 21*(8), 278-297.
Explains strengths and weaknesses of work force projection and forecasting

approaches for determining supply and demand of skilled workers. Discusses how and why job training providers should use labor market analysis as the basis for planning relevant programs.

Canny, A., & Hughes, G. (1996). Occupational forecasts for 1998 for ireland and their implications for educational qualifications.
The Census of Population provides data on the structure of employment by occupation and industry for Ireland that are supplemented by the Labor Force Survey (LFS), which collects information on employment by occupation and industry. Expected strong growth in the Irish economy from 1993-98 should lead to a significant increase in employment. This increase will not be large enough to absorb the expected rapid rise in labor force participation. In terms of sectoral forecasts, decreases are expected in the agricultural, manufacturing, and clothing and textiles sectors; increases are expected in all other sectors. Different sectoral trends in employment and continuing change in the occupational structure of sectors mean the aggregate expected change in employment will differ across occupations. Significant increases are forecast for professional, associate professional and managerial, and proprietors occupations. Occupational groups expected to experience employment declines are agricultural workers, laborers and unskilled workers, and foremen and supervisors. More than two-thirds of all net new projected jobs are likely to be secured by women. Educational data on those at work are from the LFS 1991. Analysis shows that those occupations that are predicted to grow fastest are also those with high levels of education. An assessment of the educational profile required for the new jobs that will be created from 1991-98 shows a strong trend toward higher educational requirements.

Dar, A. (2000). Tanzania. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 363-88.

Dekker, R. J. P., de Grip, A., & Heijke, H. (1994). Indicating the future labour market prospects of occupational groups and types of education in the netherlands. *Forecasting the Labour Market by Occupation and Education: The Forecasting Activities of Three European Labour Market Research Institutes.*, 55-83.

Diebolt, C., & El Murr, B. (2003). A model of glutting: Human capital and labour markets in the long-run. *Applied Economics Letters, 10*(9), 557-60.
For over a century and a half, there have been cyclical phases of saturation and shortage in the numbers of students enrolled at German and Prussian universities. Starting from this observation, this article constructs a neoclassical glutting theory. A twofold hypothesis is put forward. First, the behaviour of students in their choice of curriculum depends on the expected rewards. Indeed, the allocation of students to the various faculties depends on the comparative yields of the latter in terms of expected earnings and job availability in the corresponding professional sectors. Thus, the rewards expected by a student are represented by the earnings on the labour market at a given moment and that he or she considers to be sustainable in time. Second, an attraction phenomenon may appear for certain curricula when a

shortage occurs in different professional sectors. Once the shortage has been made up, the demand effect continues as a result of delay in the perception of the situation by young people. This may gradually lead to comparative over-production of qualified university leavers. This unbalanced situation diverts new cohorts of students to other sectors of education and may cause a new shortage, finally resulting in a cyclical movement modulated according to job availability.

Edwards, A. C. (2000). Chile. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 294-318.

Fallon, P. R., & Hunting, G. (2000). China. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 161-81.

Fluitman, F. (2000). West bank and Gaza strip. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 450-60.

Fluitman, F., & Alberts, W. (2000). Zambia. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 389-400.

Gill, I. S., & Dar, A. (2000). Germany. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 485-513.

Gill, I. S., & Heyneman, S. P. (2000). Arab republic of Egypt. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, , 401-29.

Gill, I. S., & Ihm, C. (2000). Republic of Korea. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, , 261-93.

Godfrey, M. (2000). Hungary. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 41-71.

Groes, N., Larsen, A. H., & Tranaes, T. (1994). A forecast model for unemployment by education. *Labour, 8*(2), 317-30.
We present a dynamic forecast model for the labour market: demand for labour by education and the distribution of labour by education among industries are determined endogenously with overall demand by industry given exogenously. The model is derived from a simple behavioural equation based on a strong relationship between the "strength" in the struggle for jobs of an educational group, and the change in relative supply. This relationship proves to be significant in the data. Furthermore, when used to forecast employment by education on real data, the model predicts reasonably well even for educational groups, where the initial forecast year is a change point for unemployment.

Grootings, P. (2000). Czech Republic. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 95-109.

Grootings, P. (2000). Poland. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 72-94.

Heraty, N., Morley, M. J., & McCarthy, A. (2000). Vocational education and training in the republic of Ireland: Institutional reform and policy developments since the 1960s. *Journal of Vocational Education & Training: The Vocational Aspect of Education, 52*(2), 177-198.
This overview of the Irish educational system examines vocational education and training, the role of the European Union, legislative measures, and institutional reforms. The following challenges are discussed: economic infrastructure, skill shortages, and the inclusiveness of the educational system.

Hu, R., Mao, H., & Jiang, M. (1987). A review and study of early-stage human resources forecasting and planning work in shanghai. *Chinese Education, 20*, 57-87.

Hughes, G., & O'Connell, P. J. (1995). Higher education and the labour market in ireland, 1981-1991. *European Journal of Education, 30*, 77-103.
Part of a special issue on higher education and employment in Europe. The writers present a broad statistical picture of trends in higher education in the Republic of Ireland during the period 1981-1991. They begin by considering the balance between the supply of and demand for third-level graduates and the first destinations of recipients of third-level awards. They present the results of the first comprehensive survey of the career patterns of two groups of Ph.D.'s and professional engineers who graduated during the 1980s, focusing on their current labor market status; on their patterns of external and return migration; and on income differentials between those who never emigrated, returned emigrants, and permanent emigrants. They argue that the rapid expansion of higher education over the past decade has not been matched by demand for graduates in the domestic labor market.

Johanson, R. (2000). Russian federation. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 110-37.

Laan, L. (1996). A review of regional labour supply and demand forecasting in the European Union. *Environment and Planning A, 28*, 2105-2123.

Mansfield, B. (2001). Linking vocational education and training standards and employment requirements: An international manual.
This document, the fourth volume in a series, details a process for linking vocational education and training (VET) standards and employment requirements that was developed in the United Kingdom and based on functional analysis. The introductory sections describe the other three manuals in the series and the process used to develop this manual. The following are among the topics discussed in sections 1 through 5: (1) an international perspective on efforts to meet labor market needs through VET (the purpose of VET, how the VET system responds to change, roles in development of VET standards, embedding changes in VET standards, gathering information about economic change); (2) functional activity and describing work

activity (describing behavior, task analysis, functional mapping, iteration); (3) VET standards (standards for the modern economy, new employment requirements for skilled workers, performance requirements); (4) standards, overarching requirements, and levels (completing VET standards, increasing/reducing levels of VET standards); and (5) evaluating VET standards (policy, technical, and implementation criteria and an evaluation framework for VET standards). Twenty-seven figures are included. The following items are appended: an example "technical" module; an example "overarching" module; guidelines for tracking types and impacts of economic change; a list of verbs used in the titles of VET standards; and example functional maps and modules.

Mansfield, B., Ed. (2000). Development of vocational education and training standards: The impact of labour market information. Manual, qualifications and training methods.
This is the third publication in the European Training Foundation's (ETF's) series of manuals designed to support development of vocational education and training (VET) standards. This volume looks at ways in which VET standards are linked to labor market demands and how relevant VET standards are to the needs of employment in a market economy. Part I, The Impact of Labor Market Information on VET Standards, is based on a report of ETF's Advisory Forum. The report asks "What are the needs of the economy now and in the future?"; tracks changes in important economic indicators; gives examples of Western and New Independent States' experience; and gives examples of how vocational training systems have responded to meet challenges of new economic demands. An example of a flexible VET standard designed to meet changing labor market needs is annexed. Part II, Identifying Labor Market Requirements, is an output of an ETF project to identify and develop methodologies for occupational standards in Estonia, Latvia, Lithuania, Poland, and Slovenia. It spells out the purpose of collecting and analyzing economic and labor market data so education and training policies and program remain relevant to the needs of the labor market and the wider economy; identifies needs and benefits of labor market analysis; and discusses specific research methods. Case studies of labor market analyses in Estonia, Lithuania, and Slovenia are annexed.

Minowa, M. (2000). Mexico. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets,* 319-35.

Mosk, Carl, Nakata, & Yoshi-fumi. (1992). Education and occupation: An enquiry into the relationship between college specialization and the labour market in postwar Japan. *Pacific Affairs, 65*(1), 50.
The difference between the US and Japan in terms of the relationship between education curricula and labor markets is discussed. While demand factors drive US education specialization, supply factors drive that of Japan.

Pearson, R., Jagger, N., Connor, H., & Perryman, S. (2001). Assessing the supply and demand for scientists and technologists in Europe. IES report 377.
Available evidence on the supply of and demand for professional scientists and

technologists (S&Ts) in the European Union (EU) was reviewed. The main data sources were as follows: approximately 450 reference documents; national and international governments, training and employer bodies, and key international organizations; more than 100 international and national experts from the EU; survey results from 210 research and development establishments from across Europe; and a pilot econometric modeling exercise. The analysis established that the European market for S&Ts is not homogeneous and changing rapidly. More than two-thirds of the EU's approximately 800,000 S&Ts were in Germany, France, and the United Kingdom. The European S&T labor market appeared to be broadening and experiencing continued growth, with more growth occurring in the services sector and small firms. The evidence suggested that demand for S&Ts will continue to develop and fragment. The review documented a need to improve the flexibility and responsiveness of training and methods for forecasting labor supply and demand. (Fifty-three tables/figures and 373 references are included. Information about international classifications and statistical sources, the survey methodology, and pilot modeling of the supply of and demand for research scientists and engineers is appended along with detailed tables by country.) (MN)

Rouhelo, A., & Ruoholinna, T. (2000). *Special features of the Finnish labour market and challenges for education.* Finland:
Research synthesized from three studies of the Finnish labor market indicates that a rapidly changing working life in Finland (and the rest of Europe) sets many different challenges for the workforce. In Finland, the population is even more aged than in the other European Union (EU) member states, and the transition of older workers to retirement is also happening, on average, faster than in other EU countries. Demand in the Finnish labor market is directed to the younger, and usually more educated group, while the supply comes increasingly from the aging group. Current developments in demographic structure and the eagerness of employees to take early retirement have stimulated the debate over ways of maintaining working capacity. Education and training is considered essential for older workers (aged 45 and over). A large proportion of these workers should be retrained or given supplementary training to avoid their early retirement. On the other hand, the situation of younger and more highly educated workers is not easy either. Many younger workers find themselves over-educated and under-employed, since a high level of education does not guarantee sufficient occupational know-how. Employment qualifications favored by employers are work experience, personality, and academic credentials. The challenge to education and labor policy in Finland and the EU will be to determine how to balance the work experience of older workers and the academic knowledge of younger workers.

Schmidt, S. L., Ed, Schomann, K., Ed, & Tessaring, M., Ed. (2003). Early identification of skill needs in Europe. CEDEFOP reference series.
This document contains the following papers: "Early Recognition of Skill Needs in Europe: European Conference, Berlin, 30/31 May 2002" (Susanne Liane Schmidt, Klaus Schomann, Manfred Tessaring); "Welcome and Opening of the European Conference 'Early Recognition of Skill Needs in Europe,' 30 May 2002, Social

Sciences Research Center Berlin" (Manfred Kremer); "Early Recognition of Skill Requirements in Europe" (Stavros Stavrou); "Early Identification of Qualification Needs in Germany the FreQueNez Research Network" (Susanne Liane Schmidt); "Qualifications for the Future" (Mike Coles); "Developing Prospective Tools for the Observation of Skill Requirements in Spain" (Jordi Planas); "Network of National Surveys on Skill Needs in Italy" (Mario Gatti); "Labour Market Forecasting in the Netherlands: A Top-Down Approach" (Frank Corvers); "Industrial Maintenance in France: New and Traditional Skill Requirements" (Jean-Louis Kirsch); "Identifying Future Qualification Needs in the Transport Sector in the United Kingdom: Has the Scenarios Methodology a Role?" (Tom Leney); "Addressing the ICT (Information and Computer Technology) Skills Shortage in Europe" (Martin Curley); "New Skill Requirements in Logistics" (Kathrin Schnalzer, Gerd Gidion, Miriam Thum, Helmut Kuwan); "Skill Requirements in the Care of the Elderly the Swedish Example" (Gert Alaby); "Information System for Early Recognition of Sectoral Trends Results Obtained for the Construction Industry" (Norbert Bromberger, Helen Diedrich-Fuhs); "Forecasting Female Shares of Employment by Occupation in Ireland" (Gerard Hughes, Jerry J. Sexton); "Services in Complex Structures Trends in the Way Skills Are Developing in Low Skilled Work" (Beate Zeller); "Early Recognition of International Qualifications for SMEs (Small and Medium-Sized Enterprises)" (Peter Wordelmann); "New Qualifications in SMEs for Societal and Technological Change Skilling of IT (Information Technology) Users" (Lothar Abicht, Rainer Werner); "A Note on the Evolution of Labour Supply in Spain and Its Implications at Regional Level" (Ferran Mane, Josep Oliver); "Qualitative versus Quantitative Methods of Anticipating Skill Needs: Perspective of a Country in Transition" (Olga Strietska-Ilina); "Skill Markets in a Learning Society: Transformation and Vocational Reforms in Hungary" (Pal Tamas); "A Demand-Side Analysis of SME Skills Needs in Regions of Five Candidate Countries" (Lewis Kerr); and "Identification of Future Skill Requirements. Activities and Approaches for European Cooperation" (Manfred Tessaring). Several papers contain substantial bibliographies. Lists of authors' addresses and abbreviations are appended.

Shah, C., & Burke, G. (2003). *Future job openings: Australia in the knowledge economy. project 2000-02: Changing skill requirements in the Australian labour force in a knowledge economy. working paper* No. CEET48). Australia; Victoria:
Forecasts of Australian labor market growth, net replacement needs, and net job openings to 2006 are presented using the nine-way grouping of occupations described by (Maglen and Shah, 1999). Analysis is based on classifying occupations by whether they are advantaged by globalization and technological change, relatively insulated, or vulnerable. Globally advantaged occupations are grouped by whether they are, by nature, conceptual or technical. Insulated occupations are in-person professionals, skilled workers, and low-skill workers. Vulnerable occupations are advanced skill, white-collar clerical, blue-collar operative, and manual low-skill. Findings indicate, in the medium term, overall growth in employment is expected to be 1.2 percent per year, and net replacement is expected to be 2.1 percent; turnover will create most job openings for new entrants. More than four of five jobs due to growth in employment are projected to be in the globally advantaged or insulated

occupations with projected average growth rates of about 1.7 percent per year; the average for vulnerable occupations is 0.5 percent. Because of job turnover, a substantial number of job openings will be for new entrants in vulnerable occupations, with the net replacement rate of 2.0 percent. Insulated occupations with above average growth in employment have a relatively high rate of turnover, especially among low skill groups. More than one in five of job openings for new entrants is expected in in-person low-skill insulated occupations. Appendixes include a list of 18 references and a paper on replacement demand and growth. (YLB)

Tan, H. W., & Gill, I. S. (2000). Malaysia. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 218-60.

Tessaring, M. (1993). Manpower requirement by levels of qualification in West Germany until 2010. Implications of the 1989 IAB/Prognos projection for the qualification structure of jobs. Labour market research topics, no. 4.
The extension of the 1989 Institute of Employment Research (IAB)/Prognos projection of the sectoral and job-specific labor force demand by levels of qualification shows that the previous trends toward higher qualification requirements of jobs is expected to continue in Germany. The main reasons are the significant shift in favor of secondary service jobs and the rising qualification requirements of all jobs. The expectation is that the demand for workers without a formal training certificate (unskilled workers) will continue to decline, from 23 percent (1987) to about 13 percent in 2010. Job gains are forecast for workers who complete on-the-job or school training. For this level, employment gains in service activities and losses in production jobs will balance each other. Despite an absolute increase in jobs, their share in total employment will stagnate just under 60 percent. Persons in this group who have completed further training at trade and technical schools will be more in demand, with jobs increasing from 8 percent in 1987 to approximately 10 percent in 2010. The same is true for higher education graduates. In 2010, around 18 percent of all jobs could require training at universities or polytechnics. The current view is that the shift from the former German Democratic Republic to the Federal Republic is not expected to bring about a change in the direction of these basic trends, which are being observed in most industrialized countries.

Tessaring, M. (1997). Forecasting sectors, occupational activities and qualifications in the federal republic of Germany. A survey on research activities and recent findings.
In view of German reunification, the 1992-94 recession, and ongoing demographic, technological, organizational, and social changes, alternative projections of labor market and employment structures provide policy makers with needed information. The Institut fur Arbeitsmarkt- und Berufsforschung (IAB) structural labor projection (1989) forecasted continued growth of the service sector and corresponding decline of primary and secondary sectors. An update in 1993 showed quite similar results. Labor market projections are also based on econometric models. The IAB System for Simulation and Forecasting takes into account many different types of interdependencies in the economy. Results show the level of employment will increase, whereas the labor force potential should expand less rapidly. The Industrial

Forecasting Germany model finds that labor productivity increase will exceed economic growth until 2000 causing employment to fall consistently. A 1994 projection of the structure of labor demand closely follows IAB forecasts. Service occupations will expand; demand for unskilled people will fall in all occupations. Results of supply projections prepared by the German Joint Commission of Federation and Lander for Education Planning and the Promotion of Research (1994) indicate that the supply of unskilled workers will exceed demand, and demand for skilled workers will exceed supply.

Tzannatos, Z., & Billeh, V. (2000). Jordan. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets,* 430-49.

Tzannatos, Z., & Sayed, H. (2000). Indonesia. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets,* 182-217.

van der Laan, L. (1996). A review of regional labour supply and demand forecasting in the European union. *Environment and Planning A, 28*(12), 2105-23.
In this paper I review existing models which forecast regional supply and demand in the European Union. I distinguish between five main classes of models. I also show their recent applications as well as their main features. If the findings are linked with changes in economic thinking, the direction of future model development can be indicated.

Vincens, J. (1995). Graduates and the labour market in France. *European Journal of Education, 30,* 133-156.
The writer explores the issue of higher education and employment in France. He examines the higher-education options available, the system in operation, and the labor market for graduates. Up until 1992-1993, the labor market absorbed the supply of graduates, and although weaknesses in the market since then have affected graduates, their qualifications have given them some advantage over others. Three features of recent changes in the labor market can be identified: the labor market for graduates will remain a buyers' market from the employers' perspective, university graduates will continue to search for employment in the private sector, and the institutionalized links between employers and higher education will continue to develop. Ultimately, changes in qualities and skills are related to the key problem of the relationship between the French higher-education system and the labor market.

Witt, S. F., Song, H., & Wanhill, S. (2004). Forecasting tourism-generated employment: The case of Denmark. *Tourism Economics, 10*(2), 167-76.
The empirical results from a forecasting competition show that the unrestricted vector autoregressive model is likely to generate the most accurate forecasts of international tourist expenditure in Denmark. This model is therefore estimated (using data for 1969-99) and is used to generate tourism expenditure forecasts for Denmark to 2010. The employment requirements (direct, indirect and induced) associated with these expenditure forecasts are then estimated using an input-output model. The forecasts of employment demands are shown across all industrial

sectors, and linked to qualifications data in respect of the labour force. The major impacts of foreign tourist expenditure on employment in Denmark occur in the retail, hotel and restaurant sectors. Foreign tourist expenditure is also significantly associated with graduate employment.

Zborovskii, G. E., & Shuklina, E. A. (2005). Professional education and the labor market. *Russian Education and Society*, *47*(1), 26-42.
A study investigated the educational services market and the labor market in the Urals Federal District and the educational aspirations of upper-grade students in Sverdlovsk Oblast in the Russian Federation. Data were obtained from document analysis, expert polling, and questionnaire surveying. Findings revealed that the professional education system was training a work force more highly qualified than required by the labor market. Moreover, the labor market offered more opportunities for primary professional education in connection with the steady demand for blue-collar workers, but it was unable to take full advantage of these opportunities because it remained less dynamic and flexible than secondary and higher professional education. Further findings are presented.

Ziderman, A., & Van Adams, A. (2000). South Africa. *Vocational Education and Training Reform: Matching Skills to Markets and Budgets*, 341-62.

Appendix B: Excluded References

Education and labour market pathways of young adults.(2004). *Canadian Social Trends,* (75), 34.

The new technicians study: Opportunities for entry-level workers in information technology occupations. working paper(2003). . U.S.; California:

Issues affecting skill demand and supply in Australia's education and training sector. at a glance.(2002).

Matching skill needs to training provision in the electrotechnical industry. project final report.(2002).

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From higher education to employment. volume II: Canada, Denmark, Spain, united states = de l'enseignement superieur a l'emploi. volume II: Canada, Danemark, Expagne, Etats-Unis.(1992).

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