Appendix C: Identifying Skills, Supply and Demand

Background

The supply and demand of skills— that is, what skills business requires and where those skills are found— are important training issues. This first iteration of the *Toronto Training Board Training Environmental Scan* was unable to capture an in-depth picture of the types of skills Toronto businesses require from employees and how readily available these skills are. It would be very valuable for all those involved in training to have an understanding of the skill shortages in order to better plan training initiatives. Therefore, before we address the labour market information gap on skill supply and demand, we will first discuss skill shortages.

A Primer on Skill Shortages in Canada, published by Human Resources Development Canada (HRDC) and written by Richard Roy, Harold Henson and Claude Lavoie, raises some good issues on skill shortages. It explores the current methods for capturing skill shortages and the shortfalls in estimating skill shortages. It also questions the need to capture such data. We recommend that readers obtain a copy from the HRDC Web site (http://www.hrdc-drhc.gc.ca/arb/publications/research/abr-96-8e.shtml) or contact the publications co-ordinator for Human Resources Development Canada's Applied Research Branch at (819) 994-3304.

Roy, Henson and Lavoie make good points in their research paper about the necessity of capturing data on skill shortages. Mainly, we agree that capturing data on skill shortages, especially on a national level, is incredibly labour intensive and costly. As well, this concept is definitely a shifting landscape; however, it is important to identify how the landscape is shifting.

For the purposes of the *Environmental Scan,* it is necessary to have information on the supply and demand of skills at the local level in order to develop appropriate training initiatives. The undertaking of this task will be labour-intensive but achievable because of the local focus. The following is a proven methodology for capturing occupational and skill shortages, which uses the delphi procedure. It was developed by Dr. Caroline Weber and applied to the study *Computer Professionals in Canada: A Survey of Supply and Demand* by Caroline L. Weber and Avril Phillip, Industrial Relations Centre, Queen's University, 1995.

We do not suggest that this is the only methodology available to capture occupational and skill shortages— in fact there are many. This methodology is being recommended because the above study's predictions were accurate over a duration of time, received a lot of positive media attention and is widely respected by those in government, industry, education and associations.

Estimating the Supply and Demand of Occupational and Skill Shortages: A Delphi Approach

Caroline L. Weber and Avril Phillip

Introduction

If Toronto's firms are to compete effectively in the global market place, the demand for a variety of skilled labour needs must be met. However, in order to fill the demand, we should first understand precisely the nature or quality of the demand and, perhaps more importantly, the quantity, sources and quality of the supply of skilled labour.

It is with this understanding that the effort to estimate future occupational and skill shortages in Toronto should be undertaken. The approach should be from a human resource planning perspective. Large organizations usually go through an annual process of trying to predict supply and demand for different jobs, occupations or skill groups. This is similar to the task of estimating labour supply and demand on a broader scale. However, in addition to estimating the stock and flow of human resources (essentially a Markov model of supply and demand), organizations also must try to predict changes in demand for human resources as a function of the economic growth of the firm as well as any technological changes. This is typically the most difficult item to predict, in the sense that it is usually the least accurate, or the most unpredictable. This problem, again, is similar to the problem of estimating the supply and demand of skilled labour on a broad level, in that rapid changes in technology and the economy are difficult to predict, yet are probably the major determinant of the demand for skilled labour.

In order to define and predict that which is difficult to predict, organizations sometimes use a delphi procedure to obtain estimates. This process is iterative and involves surveying various experts in the field, including executives of organizations, to obtain their estimates of future changes. After the first round of data collection, the information is summarized. The experts are contacted again, but this time they are informed of what others have said about the future. The responses are again recorded and summarized and the experts are contacted one last time to allow them to respond to the new information. This estimation procedure can be used to predict the changes in demand, as well as supply, of occupational and skill shortages.

There is sizeable literature on the delphi procedure (Dalkey 1967, 1969; Campbell and Hitchin 1968; Milkovich, Annoni and Mahoney 1972; Dyer and Blancero 1992), although not all of it constitutes research. The research experiments have generally used five rounds, but the one study that used the process to predict staffing levels (Milkovich et al. 1972) demonstrated that expert opinions converged after three rounds. Thus, in the interest of conserving resources, three rounds should be used to gather the data for the *Environmental Scan*. It should also be noted that Milkovich et al., (1972) were able to compare the predictions obtained through the delphi process with predictions obtained through various regression forecasting models the organization had contemplated using. These predictions from different sources

were compared to the actual staffing levels that occurred in the organization. The results showed that the delphi process produced the most accurate predictions of staffing levels.

The following is an example of how the delphi procedure can be used to estimate the future supply and demand of a profession. It summarizes the model used to estimate the future supply and demand of computer professionals in Canada and the way the data was collected. This approach can be modified to suit the purposes of the *Environmental Scan*.

The Model

The method of estimating the supply and demand of computer professionals is a standard 'stock and flow' inventory method. It is a method of estimating the supply and demand for labour, with special emphasis on estimates of supply. With fairly stable skill sets, and reasonable scenarios about the economy, time series analyses of historical labour supply and demand can be used to predict the numbers for each box in the diagram, and the supply and demand can then be calculated.

However, computer skills do not represent a stable skill set and, historically, have been very difficult to predict (even on the supply side) due especially to rapid changes in technology. There are large fluctuations in the rate of growth of supply and demand for computer professionals, making prediction based on historical information problematic. Thus, the delphi method was used, instead of projections based on historical data, in order to derive estimates for the various components of supply and demand in the model.

The Data

The sample was obtained by mailing surveys to organizations known to be major employers of computing professionals. This sample included major retailers and manufacturers, telecommunications companies, utilities, oil companies and firms of consulting engineers, as well as government organizations, public service organizations, educational institutions and major computing companies. Three rounds of the survey were mailed and it took a year to gather and analyse all three rounds. The response rate was 11 percent. This small sample size is not unusual for delphi surveys, where sample sizes of 15 to 20 experts are the norm. As well, the sample was broadly representative of large organizations and institutions in Canada. About 100,000 people were employed by these organizations.

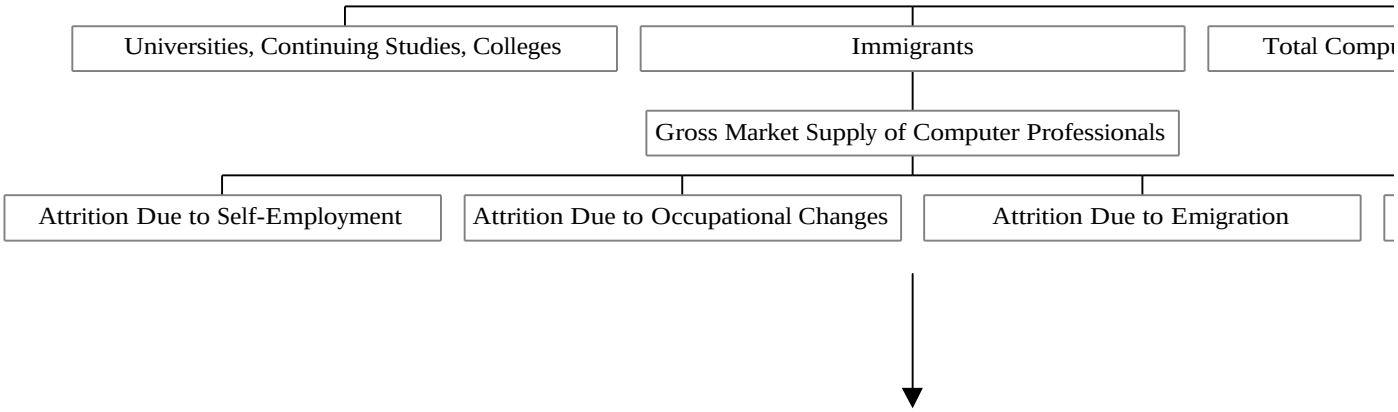
In addition to questions about the components of supply and demand, the experts were also asked some open-ended questions (on the first round only) to identify future areas of change in computer technology as well as future areas of critical demand in computer professionals.

So that the experts would all start from the same point, they were provided with data from the 1986 census (1991 data were not available when the data collection process began), data from the Canadian Occupational Projection System (COPS— Employment and Immigration Canada Information Man-

ager), as well as results from the 1986 National Graduates Survey (Clark 1988). Respondents received three iterations of the survey, except when prohibited by small numbers.

Diagram 1

Net Market Supply of Computer Professionals Available for Hire by Organiz



Net Market Supply of Computer Professionals

Diagram 2

Net Organizational Demand for Computer Professionals