LABOUR INPUT TO THE SERVICES SECTOR

Session 3

Voorburg Group Meeting
September 11-15, 1995
Voorburg, The Netherlands

Emmanuelle Avon
Statistics Canada

TABLE OF CONTENTS

INTRODUCTION

With the trend toward globalization of the economy (free trade agreements, the European Common Market), we can see more clearly than ever the importance of the interrelatedness of the various nations' development models. In fact, each nation has a way of perceiving its development and establishing growth strategies that take account of the various threats and opportunities that it perceives in the new global marketplace. It is therefore imperative for Canada to identify the distinctive strengths that it can draw on to ensure that it achieves the best possible socio-economic development as well as optimum management of its technological resources. Along these lines, we can identify our strengths in industrial terms (financial resources, availability of innovative technology, infrastructures and capacity), and also in terms of manpower (flexibility-insecurity, mobility-industrial concentration, training-employment).

It is important to recall that since the 1980s, Canada has achieved prominence in the sphere of technological innovation. Thus we can ask ourselves what conditions are needed to support this technological innovation and use it to achieve a sufficient competitive advantage to meet the challenges posed by the globalization of the economy. Lastly, we can ask ourselves whether the high-end technology sectors are sufficient to ensure healthy growth of the job market and to pursue real development of the knowledge-based economy.

In line with this global perspective, the quality of human resources is at the core of the development of high technology services. We have therefore carried out this analysis of labour using census data in order to gain knowledge of the service industries from the point of view of its workforce.

The important growth of the service industries leads us to ask if our manpower can support the development of this sector. We will see, at this stage of the analysis what type of training our workers possess and in what sectors they are concentrated. Conversely, we will see what type of work, in terms of status and income, these industries offer the labour force. In particular, it is important to understand the role of professionals working in the high technology service industries. We believe that this group is the foundation for the development of those industries which provide Canada with its distinct advantage. We have thus structured the analysis according to the occupational structure as shown in Table 1.

Table 1
Structure of the Occupations Studied

A) All Major Occupation Categories of the Canadian Standard Occupational Classification	B) All Professional and Technical Groups in BUS, Natural & Applied Sciences (studied in Section B)	C) Managers and Professionals in the Natural and Applied Sciences (studied in Section C)
1) Management occupations		1) Managers in Engineering, architecture, science and information systems
2) Business, Finance and administrative occupations	1)Professional occupations in business and finance 2)Finance and insurance administrative occupations	
3) Natural and applied sciences and related occupations	3) Professional occupations in natural and applied sciences	2) Physical science professionals 3) Life science professionals 4) Civil, mechanical, electrical and chemical engineers 5) Other engineers 6) Architects, urban planners and land surveyers 7) Mathematicians, systems analysts and computer programmers
	4) Technical occupations related to natural and applied sciences	
4) Health occupations	5) Professional occupations in health	
5) Occupations in social science, education, government service and religion 6) Occupations in art, culture, recreation and sport 7) Sales and service occupations 8) Trades, transport and equipment operators and related occupations 9) Occupations unique to primary industry and to processing, manufacturing and utilities		

As indicated, we have first analysed all the occupations of the labour market in order to have a picture of all workers in Canada (according to the major categories of the Standard Occupation Classification), paying particular attention to the services industries. We observed their characteristics in terms of industrial distribution, education, work activity and income[1].

Next, we have chosen the professional groups which are mostly in the services industries in order to see if one can characterise this labour in the same way as in the previous section. In particular, we look at the links between the qualifications of this type of labour and the type of employment.

Finally, we have concentrated on the professionals and managers in the natural and applied sciences. These groups are of particular interest because they are important in the high technology services industries, especially business services. We wish to understand the profile of this key type of labour in the high technology services and what type of employment these industries offer the labour.

Our observations:
We have, at the first stage, studied the profile of the employed Canadian labour force in 1991. We find that it is characterised by a three-fold polarization. First we observe major differences between the manpower of industries that produce goods and those that provide services. Next we observe polarization between professionals and non-professionals in the two major groups of goods-producing and service industries. Lastly we note polarization among non-professional workers, between specialized and non-specialized workers. The latter distinction is especially important for service industries.

Second we have concentrated our analysis on professionals likely to be employed in the high tech service industries. In this group we observe the same characteristics of polarization as in the labour force as a whole. We have focused particular attention on the service industries.

Lastly, we have conducted an analysis of professionals associated with cutting edge high-end technology (engineers, architects, computer specialists as well as managers in the fields of engineering, architecture and computer science). It is here we find the technological strengths of certain major services industry categories that point the way to a competitive advantage.

A. The major occupational categories

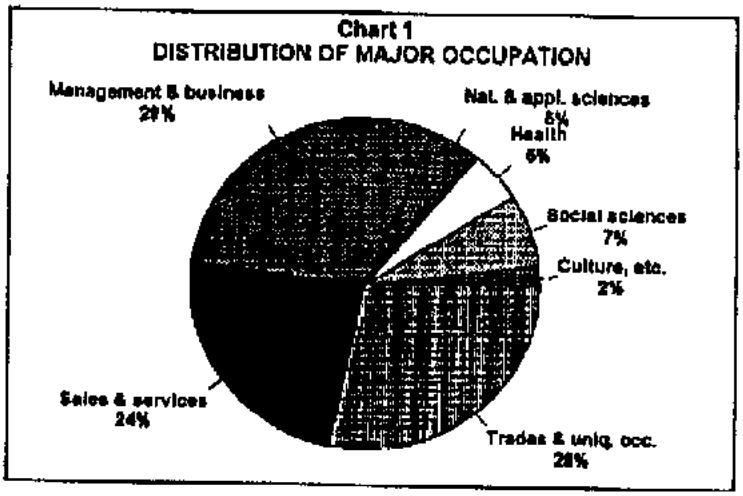
In this section we study the major occupational categories as shown in Table 1 in the introduction. We then analyze the characteristics of the group with particular attention on those in the marketed services industries.

---

[1] See definition of each concept in appendix 1.

We found that overall, the labour force studied exhibits a certain polarization between professionalization of work and specialization of tasks[2]. The professionalization of work includes 40% of the labour distributed over management and business (29%), the natural sciences (5%), the health field (5%) and the social sciences (7%).

On the other hand, 54% of the labour force in the same year consisted of specialized and non-specialized workers employed in sales and services (24%), the trades, transport and equipment operators group and the occupations specific to the primary sector and the processing secondary sector and any other public utility (28%), as well as workers in culture, art, etc.(2%).



There may be considered to be a form of polarization insofar as these two major groups differ greatly in terms of industrial characteristics, level and type of education, work activity and income. We suggest that polarization is occurring in the sense that these two major groups appear to have been moving in different directions for some time and these trends seem likely to continue.

However, it is essential to note at the outset that these two major groups are not homogeneous, and within each the relative importance of specialization tends to shape the profiles for education, work activity and income.

---

[2] Professionalization: The worker possesses an expertise in his work governed by standards established by a professional body, or a particular body of knowledge specified by the organization to which the worker belongs. Some examples are lawyers, accountants, notaries, doctors, etc. and also some other jobs such as police, researchers or social scientists.

Specialization: This is applied to workers who are not members of a particular organization. The standards governing the work are determined by the organization itself through the descriptions of the tasks comprising the work. Some examples are clerical workers, salespersons, etc.

1. Industrial characteristics

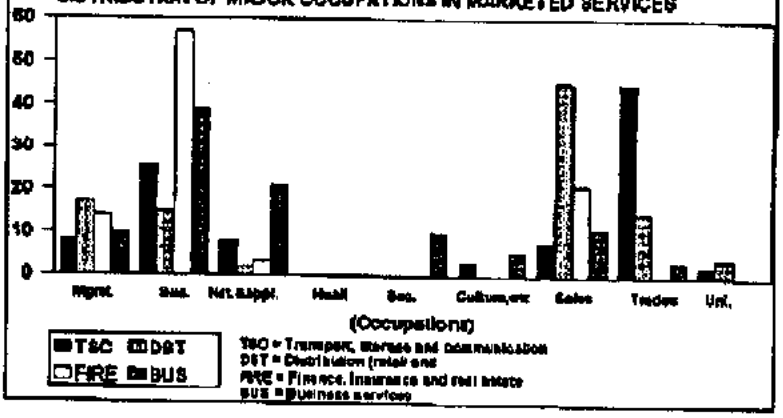
First, this labour force as a whole is divided between goods-producing industries at 27% and service industries at 73%. Goods are basically produced by manpower consisting mainly (68%) of persons employed in occupations specific to the primary and processing secondary sectors and specialized workers in the trades.

On the other hand, the great majority of the manpower of service industries is drawn from two major groups, namely managers (32%) and sales and service workers (37%).

Broadly speaking, 36% of the experienced, employed labour force of the services industries are in marketed services, while non-marketed services account for 24%. Finally, 13% of the workers are in food and accommodation services.

Within the marketed services, retail and wholesale distribution accounts for 17% of the experienced[3], employed labour force. Nearly 8% are employed in transportation, storage and communication, (TSC), as compared to 6% in finance, insurance and real estate industries (FIRE) and 6% in business services.

Chart 2
DISTRIBUTION OF MAJOR OCCUPATIONS IN MARKETED SERVICES



2. Educational characteristics

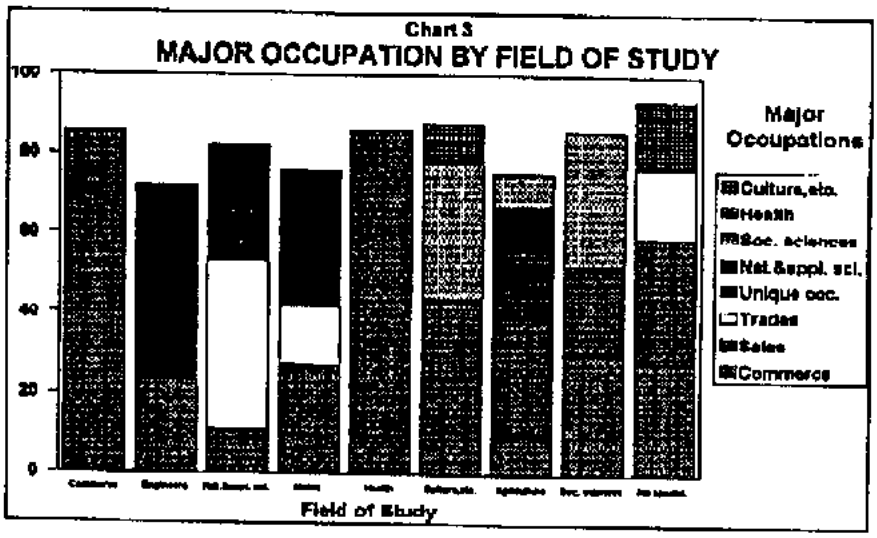
In general, persons employed in service industries have a higher level of education than those in the goods industries.

3 The experienced labour force refers to those who have already worked, whether they are currently employed or unemployed.

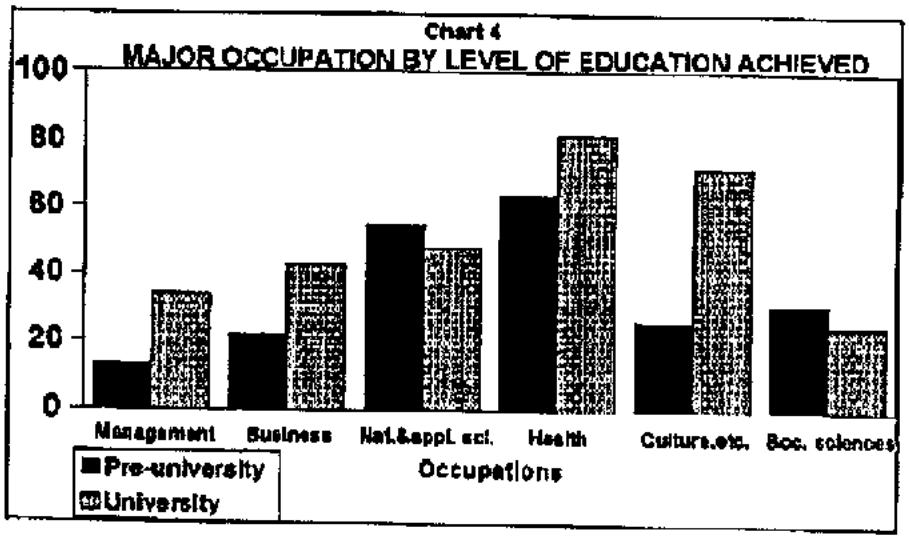
The two major groups (professionals and specialized or non-specialized workers) exhibit quite different educational characteristics. First, professionals constitute the groups with the highest levels of university education; 94% of persons with doctoral-level education or medical studies are employed in the health occupations (49%), the social sciences (29%), the natural sciences (9%) and management (7%). A majority of 74% of persons with university education are professionals in the social sciences (29%), management (17%), business (17%) and the natural sciences (11%).

In turn, 79% of persons with pre-university levels of education are employed in sales and service occupations (27%), business (20%), trades (18%) and occupations in the primary and secondary sectors (14%).

The correspondence between education and employment is thus strong, according to the type of employment. Further, amongst the 45% of workers having a specialized education, the greater the workers' specialized training, the higher the rate of correspondence with a job identified with such training. Among those who have studied commerce, 86% are employed in management and business and in supervisory positions in sales and service. Among those who have studied engineering, 72% are employed in either the natural sciences (49%) or management (23%), possibly as consultants. A majority of 71% of workers with an education in the applied sciences are employed in occupations likely to require such training (42% in the trades, 14% in occupations specific to the primary and secondary sectors and 15% in the natural sciences). Among persons employed in the health field, the correspondence is 70%. For workers with an education in mathematics, the correspondence is not as pronounced, but a solid majority of 61% are employed in either the natural sciences (34%) or management (27%).



Lastly, for the 55% majority of workers with no specialization, there is a very high correspondence with occupations not demanding any specialization of its workers (eg. sales and services, (31%) the trades, and occupations specific to the primary and processing secondary sectors).



3. Work activity and employment income

At this stage we are looking at the relationships between work activity and employment income for the major occupational categories.

3.1 Work

Here we note a significant overall pattern of job insecurity[4]. In 1991, only 56% of the employed labour force had a full-time job for the entire year. In other words, 44% had an insecure job, in that one person in four had a full-time job for part of the year, with contractual or temporary employment status, while 7% worked part-time for the entire year, and one person in ten had an especially insecure work situation, namely part-time employment for part of the year.

4 "Insecurity" or "precarious" job. This term is drawn from the literature on recent trends which shows a tendency for companies to provide non-permanent, full time jobs. This results in more contractual, temporary and part-time workers, giving business more flexibility in its labour force. This trend resulting in more precarious or insecure job status started in the 1980s.

A point worth noting, on the one hand, is the asymmetrical breakdown of job insecurity between professionals and other categories of workers. On the other hand, differences may be observed in the job insecurity rates of goods-producing industries and service industries. It may thus be seen that managers (79%), business persons (60%) and persons employed in the social sciences and natural sciences (71%) exhibit high levels of full-time employment, and these percentages are the same for goods-producing industries as for service industries.

However, for persons employed in the health field, sales and service, culture and art, trades or occupations specific to the primary and processing secondary sectors, job insecurity is generally greater. Moreover, this insecurity is more pronounced in the service industries than in the goods-producing industries. In services, job precariousness affects nearly one person out of two employed in culture and art, the health field, sales and service or occupations specific to the primary and processing secondary sectors[5]. Only the trades have a job insecurity rate of 40% in the service industries, lower than the 53% rate in the goods-producing industries.

It is thus clear that amongst the specialized and non-specialized workers there is a gap: the workers having a specialized education have better employment conditions.

3.2 Income

Clearly, the patterns for all the major occupational categories are characterized by the effects of job insecurity and a lower income in comparison to full-time workers. Moreover, income differences become more pronounced with higher levels of job insecurity. More specifically, persons employed full-time for part of the year have higher incomes from employment than those employed part-time, while among part-time employees, those who work the entire year have higher incomes than those who work only part of the year. These patterns in the relationship between incomes and work activity hold for all occupational fields.

Conclusions:

We can suggest some preliminary conclusions from this analysis of the characteristics of all occupations.

First, the great majority of workers are in the services industries and especially the commercial services. Next, professionals have a high level of university education and a high level of correspondence between their education and occupations. Further, their type of work activity and income levels are superior than that of the other categories of workers.

---

5 For workers in the health field, culture and art, sales and service or occupations specific to the primary and secondary sectors, the job insecurity rate is considerably lower in the goods-producing industries than in the service industries, although it remains sizable in comparison to the rate among professionals.

Finally, we suggest that amongst the non-professional workers, those with specializations have a field of employment related to their education and better working conditions (in terms of security and income) than the non-specialized workers.

It is clear, however, that although the specialized and non-specialized workers are well trained in their areas of work, they are faced with a greater insecurity or precariousness in their working conditions.

B. All professional and technical groups in business, natural and applied sciences and health

At this stage we concentrate our analysis on the five groups of professionals in the three major fields of business and finance, natural and applied sciences and health occupations. These groups of professionals play major roles in the high-tech, knowledge-based areas of the economy, the full elaboration of which will be a goal of the future stages of this work[6]. We thus focus on business and finance professionals, finance and insurance administrative personnel, professionals and technicians in the natural and applied sciences, and health professionals, who together represent 8% of the employed labour force in 1991.

In this occupational group, more than half are either professionals (30%) or technicians in the natural and applied sciences (28%). These two groups of professionals represent half of the manpower in the natural sciences, and they are therefore especially crucial for the future of this field of professional activity. A further one-third are professionals employed in management: management professionals (18%) and administrative personnel (15%). Lastly nearly 10% are health professionals.

It is noteworthy that the three groups of professionals -- in management, the natural sciences and health -- stand out with respect to education, in terms of both their level of education and the concentration of their education in a particular discipline; they also stand out with respect to work activity and income in relation to the other two occupational groups identified, namely specialized workers in administration and in the natural and applied sciences.

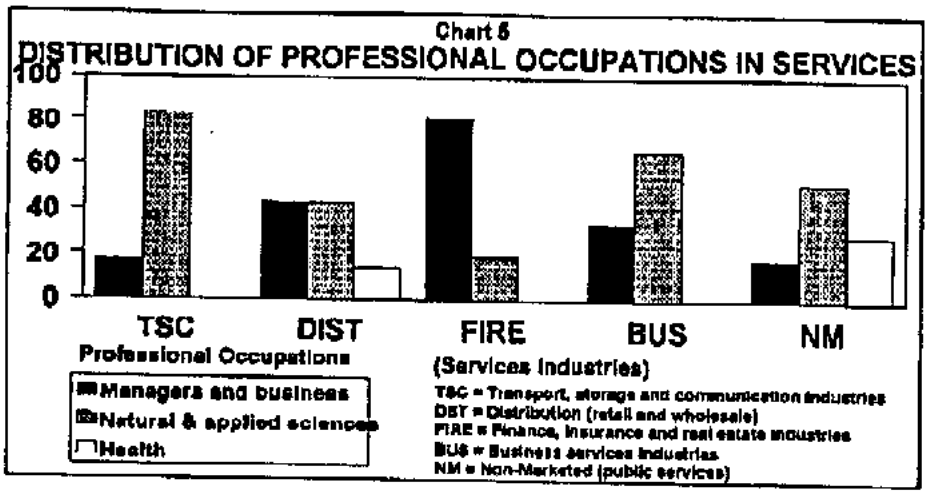
Lastly it is of considerable interest to note at this point that professionals and technicians in the natural and applied sciences stand out very clearly from the other two groups of professionals, namely those in management and in the health field, in terms of the characteristics of their employment.

---

6 Please see column B in "Structure of the Occupations Studied".

1. Industrial characteristics

The distribution of these occupations between the goods-producing industries (23%) and the service industries (77%) fairly closely reflects the distribution of the labour force as a whole with all occupational categories combined. Amongst the goods-producing industries, more than three quarters of the professionals and technicians are in the natural and applied sciences. For the services industries, one out of every two professionals or technicians is in the natural and applied sciences. An indication of where technology-based or scientific careers lie is that 36% of natural science professionals are found in business services industries (BUS) and in transportation and communication, (TSC), whereas only 27% of business professionals are in these two types of industries. In effect, the high representation of engineers and scientists suggest the presence of an infrastructure favouring innovation in the areas of high technology services. (We will examine in greater detail the professionals in the different marketed services industries in section C).

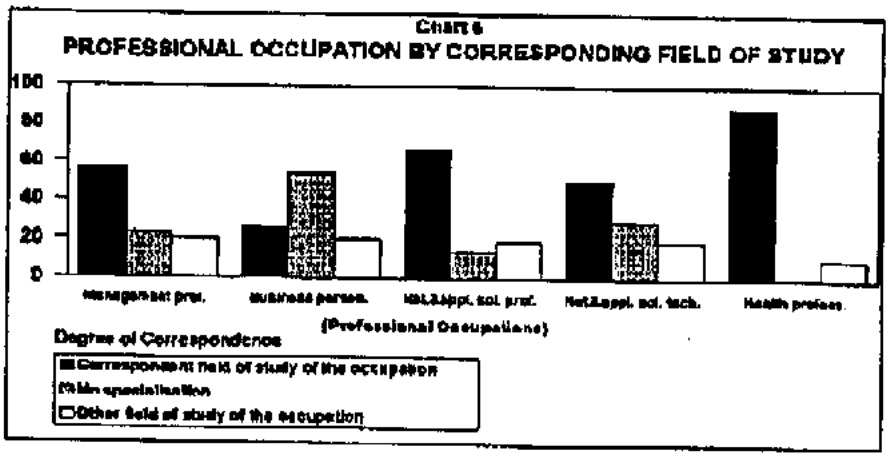


2. Educational characteristics

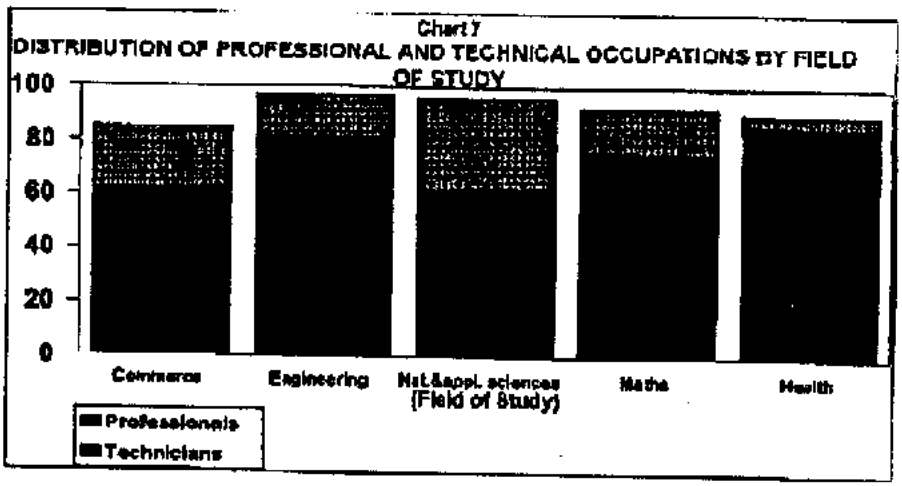
It is the level of education that shows major differences between professionals and technical personnel in management, on the one hand, and in the natural and applied sciences on the other. A majority of professionals have obtained university-level education, in either management (53%), the natural sciences (59%) or health (97%). On the other hand, technical personnel in administration (84%) and the natural sciences (86%) tend to have studied at the pre-university level. These proportions apply to both the goods-producing and the service industries.

Clearly, for these occupations as a group, the degree of specialization is much greater than for the overall labour force studied. Fully 75% of these occupations have a specialized education, as compared to only 45% of the general population.

It is worth noting the rate of correspondence between the type of specialization and the professional field. For the fields studied, it may be observed that among persons who have studied management, 62% are managers; among those who have studied engineering, 82% are professionals in the sciences; among those who have studied the applied sciences, 62% are technicians in that field; among those who have studied mathematics, 76% are professionals in the natural sciences; and among those who have studied in the health field, 86% are professionals in that field.



For all of these occupations it is clear that the level of specialization in the field of work is greater for professionals than for technicians as a group, and that a greater majority of the former than of the latter are so specialized.



3. Work activity and employment income

A greater majority of the occupations studied (70%) are employed full-time than is the case with the employed labour force as a whole (54%). The figures are especially high for professionals in management (75%) and in the natural sciences (76%). Among those in more insecure work situations, 22% are in the most advantageous situation, namely contract employment or full-time temporary work for part of the year. This is the form of employment of nearly one professional in three in the health field, more than one technician in four in the natural sciences and one professional in five in the natural sciences.

Nevertheless, one person in four employed in administration works part-time. More of these workers than any others in our study experience this most insecure form of employment. Thus it is not surprising to find that these workers' level of employment income is the lowest of all the professionals studied. On the other hand, health professionals, who are the most likely to be engaged in contract or temporary work actually have the highest level of income of all the professionals studied.

However, the income levels of professionals in management and the natural sciences and technicians are comparable.

It is worth noting here that for professionals and personnel in management, the communication industry is the field in which incomes are the highest in the service sector, whereas for professionals and technicians in the natural sciences, incomes are highest in the communication and transportation industries.

One final point: for these professionals in management and the natural and applied sciences, the business services industry offers less attractive employment income than the communication or transportation industries or even the government. At first glance, then, it would appear to be less advantageous for these professionals to work in the business services industries than in communication or transportation. However, as we will see in the following section, the professionals in the natural and applied sciences have excellent working situations in the business services industries.

Conclusions:

In conclusion, the professionals and technicians considered in this section are concentrated in the services sector. The professionals and technicians in the natural and applied sciences constitutes the greatest part of the occupations studied. Amongst the business services, these scientific professionals are located to their advantage in business services and transportation and communication. These industries are the most advanced in the domain of innovative technology.

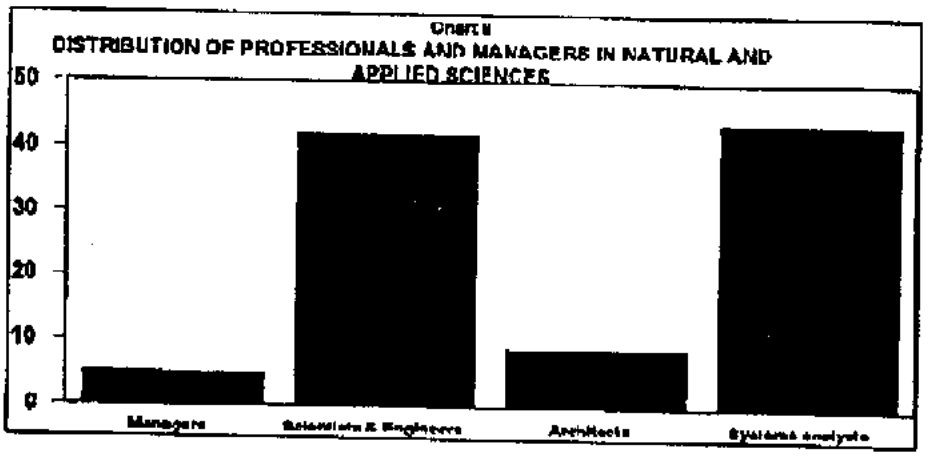
The majority of these occupations examined had a high rate of correspondence between their field of study and type of employment. Finally, the great majority of them have excellent working conditions in terms of work situation and income.

C. Managers and professionals in the natural and applied sciences

In this last section we will study professionals in the natural and applied sciences[7]. There is a great deal of interest associated with them given their important contribution to the high technology services industries. Even though they represent only 3% of the labour force, their impact on the development of the knowledge economy is a determining factor in our capacity to develop our strength in that important aspect of our economy.

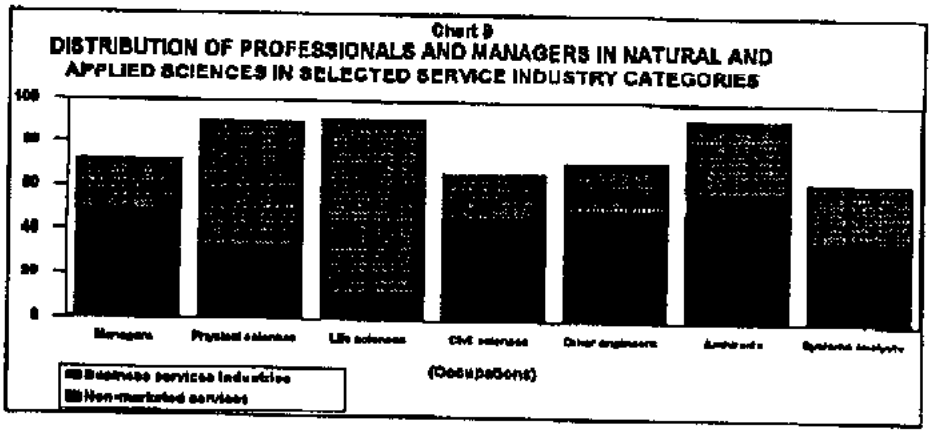
These professionals are of special interest for their occupational mobility, both within their field of competence and in management positions in the service industries. It is moreover for this reason that we have included managers employed in engineering, architecture, science and information systems. We thus observe among these natural science professionals the four categories of scientists and engineers (in physics, life science, civil and mechanical engineering and any other engineering speciality), architects, urban planners, mathematicians, systems analysts and computer programmers.

The great majority (73%) of these professionals are in the services industries; systems analysts and computer programmers are the most numerous (44%). Two engineers in three are professionals in civil, mechanical, electrical or chemical engineering and are mainly employed in business services (32%), transportation and communication (17%) and government (14%).



[7] See column C of "Structure of the Occupations Studied".

The two major service sectors in which these professionals as a group are the most significantly represented are business services (70%) and public sector services (28%).



Still looking at service industries only, 14% of managers, 26% of civil engineering professionals and 11% of systems analysts and computer programmers are employed in transportation and communication. Lastly, computer specialists are the most numerous professionals in the distribution fields as well as in the financial and real estate fields. Thus, we can see the importance of marketed services in hiring these high-tech professionals.

2. Educational characteristics

There is a very interesting fact about these professionals; it may be observed that a majority (52%) of systems analysts and computer programmers, who are employed in a wide variety of service industries, have only a pre-university education. In terms of their field of study, the majority of them have studied in the applied sciences or have no specialization (35%). Among those who have studied at the university level, 56% have studied mathematics; for these professionals, then, the rate of correspondence between their field of study and their profession is 73%[5]. In these high-tech occupations, keeping up-to-date in knowledge is very important. Further training (beyond the post-secondary non-university training) is likely acquired while working within a business.

Nearly two-thirds of professionals in engineering and managers have university degrees, including doctoral degrees. The rates of correspondence between their occupation and their education are very high: 71% for managers in engineering, 67% for life science professionals, 84% for civil engineers and 71% for other engineers and scientists. We see then that for high technology occupations, a university-level education is very important.

[5] Training in mathematics, for its part, accounts for 62% of professionals in the physical sciences.

3. Work activity and employment income

The great majority -- 77% -- of professionals in this category are employed full-time throughout the year. Barely one professional in five is employed full-time for part of the year (on a contractual or temporary basis). Very few of these workers (less than 4%) are employed part-time. A somewhat higher proportion, some 30%, of professionals in the life sciences and architects experience the more insecure forms of employment, working mainly in public-sector services. The employment income of these two categories of professionals is moreover lower for all forms of employment. Systems analysts and computer programmers have the same low levels of income as architects and professionals in the life sciences.

Hence the highest levels of employment income are firstly managers, followed by civil engineers, other engineers and professionals in the physical sciences. It may thus be observed that engineers' ability to work as professional engineers or as managers is to their advantage, as can be seen by their work activity (88% are employed full-time) and in their high levels of income. This is particularly true if they are employed in communications, finance, transportation or business services.

Furthermore it is essential to note that for all these professionals, income is much higher in the communication, transportation and finance industries and in government than in all other service industries. One final point: for all professionals as a group, the only goods-producing industry in which incomes are higher than those in service industries is the mining industry.

Conclusions:

It may be concluded that these professionals are highly specialized and find development opportunities in the business services, transportation and communications industries as well as in public-sector services. The forms of employment and incomes associated with the service industries are conducive to the stability of this manpower.

The analysis of the seven sub-groups of professionals reveals several interesting points. First of all, the systems analyst professionals are very important but they have the lowest level of education and the lowest levels of income.

Life science professionals and architects have a high level of university education but they face unemployment difficulties (instability) and income levels amongst the weakest in the group.

Finally, professionals in management and engineering have a high level of university education, an excellent work situation and a high level of income, especially in the marketed services industries (particularly business services and transportation, storage and communication) where high-technology plays an important role.

CONCLUSION

In analysing the characteristics of the employed labour force as a whole, we have clearly seen the importance of specialized training. The more workers are specialized, the better their working conditions and income. Thus the flexibility of less specialized manpower is expressed in terms of job insecurity and lower income levels, whereas the flexibility of specialized and professional manpower is expressed in terms of mobility for the purpose of exploiting industrial development opportunities and the possibility of seeking a more advantageous employment income.

We have seen that a majority of professionals in the health sciences, the social sciences and culture and art are in public-sector services, whereas professionals in the natural sciences are to be found in greater numbers in marketed services (transportation and communication (TSC), finance and real estate (FIRE), retail and wholesale distribution (DIST) and business services (BUS)). Thus these professionals are employed in high-tech fields that are in the forefront of innovation and rapidly expanding. The working conditions of these professionals are highly advantageous, favouring retention of such expert manpower. This is conducive to investment in, and development of, industrial sectors of the knowledge-based economy.

We may therefore conclude this first stage of the study by affirming that the professional and technical manpower employed in high tech service industries is a distinctive asset in that it is stable, expert and flexible. It is thus fundamental importance for us to know the characteristics of the expertise of this manpower and its working conditions in order to better understand and thus ensure the development of the knowledge economy. In developing these industrial sectors where these professionals work, Canada will be able to exploit a competitive advantage in the face of technological opportunities.

In following up on this study we will explore the distinctions between the different age categories and the genders in order to see how young persons and women fit into this new form of economic activity that is high-end technology. It will also be important to assess the current demographic profile of the key, knowledge-based industries to see if their workforce needs can be met in the near and medium-terms. Finally, it will be especially important to conduct studies spanning a period of time, since we must develop a vision of the trends that will shape the economy of tomorrow in Canada.

Appendix 1: Definition of Terms and Categories Used

1. Industries: The major industrial categories are grouped as follows:

Goods Producing Industries

Services Producing Industries ------ Marketed ------ Transportation, Storage and Communication (TSC)
------ Distributive Services (DIST)
------ Finance, Insurance and Real Estate (FIRE)
------ Business Services (BUS)

----- Non-Marketed - including Government, Health, Education

----- Miscellaneous - accommodation and restaurants

2. Education: There are two dimensions to the concept of education: the level attained and the field of study. The former refers to the level of education achieved in the official education system. Not included is any other training outside the system such as training in a business.

There are 3 major categories:
A) Primary, Secondary, Trades (pre-university)
B) University degree
C) Medical degree or doctorate

In the analysis, the level of education is always used together with the field of study or discipline.

3. Work Activity: We speak of work activity since we only know the measure of work in terms of its overall schedule and not the status of employment. We can hypothesize a link between work schedule and status as follows:

Work Activity	Work Status
1) Work Full time, Full year	Permanent
2) Work Full time, Part year	Contractual, temporary
3) Work Part time, Full year	Permanent, part time
4) Work Part time, Part year	Contractual or temporary part time

4. Income: Income is considered only as the median of employment income. We have assumed the distribution of income to be normal and that the occurence of median income reflects the norm of the type of income for each occupation. The median total income was not used in the analysis because it is influenced by other incomes, for example from a second job or from investments. Given that we wish to discover linkages between income, occupations, work activity, education and the industry of work activity of individuals, we would like to avoid the influence of other sources of income in the analysis.

We can perhaps indicate, with this variable, an interesting observation. It appears that the gap between median employment income and median total income is greater for workers having a low median employment income. It seems that workers having a low income from their principle employment compensate with secondary employment. This phenomenon is observed for sales and service occupations and in the culture and art type of occupations.