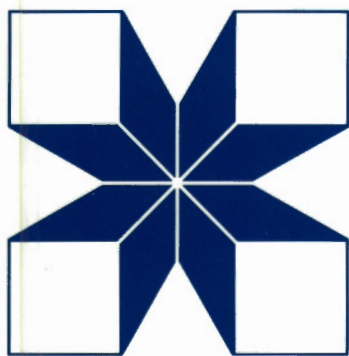


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C A N A D A

# **UNE STRATÉGIE DU DÉVELOPPEMENT DES RESSOURCES HUMAINES**

COMMUNICATIONS DÉCOULANT  
DU SÉMINAIRE-ATELIER TENU  
À YAOUNDÉ, CAMEROUN,  
DU 2 AU 5 FÉVRIER 1988

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## **Une stratégie du développement des ressources humaines**

Communications découlant du séminaire-atelier  
tenu à Yaoundé, Cameroun, du 2 au 5 février 1988

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# **Yaounde Seminar on Human Resources Development in Africa within the Research and Development Context**

**(2-5 Feb. 1988)**

The training of highly qualified  
manpower and the utilisation and maintenance  
of high level competency and skills -  
policies and practice in the OECD countries.

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Training of Highly Qualified Manpower and the Utilisation and Maintenance of High Level Competency and Skills - policies and Practice in OECD Countries.

(Fifteen Summary Theses)

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**Hans G. Schutze :**

**I. INTRODUCTION : Human Resources and Economic Development**

1. Objectives, scope and limitations of the paper

The present paper is limited to policies, practice and experience regarding human resources development utilization and maintenance in OECD countries. It must therefore be read with reference to the economic, social and cultural context of these countries and should not be understood as a guide to, or a forecast of the developments in African countries. However, given the universal nature of the problem, the experience of advanced industrialized countries might provide a useful point of reference for the discussion on African policies and developments.

2. The Human Factor in Economic Development

Knowledge has become a central economic resource-being of equal importance with other central factors of production such as physical capital.

The systematic acquisition of knowledge through education and training has replaced experience as the foundation of productive capacity and performance. The development of human resources has, therefore, become a necessary prerequisite to economic development.

3. The context : Knowledge Explosion and Structural and Technological Change.

The generation and dissemination of new knowledge and concomitantly the obsolescence of dated knowledge, is occurring at an exponential rate. Learned estimates suggest that since about the 1960's the overall body of human knowledge is now doubling in size every 10-15 years. Almost in all sectors of society, increasingly traditional experience is substituted by scientific knowledge. This process is further accelerated by the increasing use of new technologies, in particular, in engineering and natural science. On the applied level of scientific knowledge, i.e. in the economic sector as a whole, and notably in the productive sector, the massive introduction of new technologies is profoundly changing the world of work. Technological change is thus the single by far most important factor of structural change which industrialized countries are presently undergoing.



## II. The Training of Highly Qualified Manpower.

### 4. Higher Education : Quantitative Developments

In most OECD countries, Higher Education is not the only but by far the most important provider of high standard education and training. Higher Education developments which had surged in the 1960's and 1970's has levelled off in most countries at the beginning of the 1980's. In most OECD countries the Higher Education enrolment ratio of the 19-24 age group, still the most important age group in universities and colleges, is above 20 %, ranging from highs such as 48 % in the U.S., 35 % in Canada to lows such as 7.5 % in Portugal and 14 % in Greece. In addition to this age group, the number of non-traditional age students has been sharply increasing in many countries. Likewise, the number of post-graduate students has sharply risen in many countries, often even more quickly than first degree enrolments.

### 5. Higher Education and Training : From an Elite to a Mass System of Higher Education.

The enormous increase in student enrolment has triggered off a veritable explosion not only in terms of numbers of new higher education institutions, research facilities, academic researchers, and teachers, and resources assigned to higher education, but also regarding new forms of provision, new patterns of authority and a new understanding of the relationship between Higher Education and work. While prior to the 1960's access had been limited by strict academic entry requirements and financial barriers, the system of higher learning has within the last two decades, evolved from an elite to a mass system of higher education. This process of opening up widely the gates of Higher Education while responding both to social demand and demand for a higher skilled workforce, has also created a number of important problems. These include overcrowded research facilities leading to tightly controlled access in some fields of study, (e.g. medicine, dentistry, biology) bureaucratic structures due to size and ensuing inflexible rules governing curricula, modes of delivery or exams.

### 6. Higher Education and Research.

While research has grown in terms of the future perception of its importance and hence the resources devoted in many countries, universities are no longer the only or even the primary locus where research is conducted. Partly due to the advent of the masses on campus, in the classroom, libraries, and laboratories, and the ensuing preoccupation of many institutions with the overwhelming task of teaching and training, much of publicly funded research both basic and applied has moved out of the academy to other places (e.g. CNRS in France, Max-Planck Society and a dozen of highly specialized single purpose research facilities in Germany). Thus depending on the country, only between of 15 and 30 % of the total R-D is done by the universities. Private business, in particular big corporations, have dramatically increased their research budgets and devote unprecedented sums of money - both in real and relative terms - for research. While the large

share of this is spent on the firm's premise, still important sums are spent on joint research projects conducted together with universities and research institutions in various forms of cooperative arrangements. While this cooperation with industry often entails a number of problems for academic research, it also yields benefits not only in terms of additional financial resources, modern technology and other equipment needed for research that public institutions often do not have, but also with respect to a sharpening of the focus and a better definition of university research as well as to an improved preparation of the students for working life.

### III. The Utilisation of Highly Qualified Manpower

#### 7. Educational Planning and the Real World : The Mismatch Problem.

Efforts to predict, to any reliable degree, the quantitative needs of the labour market for different categories of trained manpower, have failed in the past, and, it is safe to say, will do so in the future, in spite of more complete data and more accurate tools for analysis. This is due to the great variety of factors influencing such demand i.e. demographic, economic, and political variables, behavioral time lags on the supply side, or accelerator or decelerator effects on the demand side. Therefore, both state educational planning as well as the reliance on self-regulation market mechanisms have not been able to prevent, in any significant way, trained manpower surpluses or shortages in the various occupational fields. On the contrary, forecasts of training needs, and concomitant policies or measures to influence enrolment behaviour and patterns have, in some instances, contributed to such mismatch.

The same is true, however, for the effects of market mechanisms. Thus, e.g. in the U.S., the rapid expansion of Higher Education in the 1960's created a high demand for faculty and research staff. In addition, there was a strong demand for college graduates and in particular for PhDs a result of the emphasis on research and development generally, space research and technology in particular. Due to the resulting shortage of PhDs, the "market price" for such highly qualified manpower grew remarkably, which led in turn to increased enrolment and supply of graduates and PhDs which entered the labor market when demand for new faculty was slackening and the research and development budget were undergoing important cuts. The results was either unemployment of highly trained manpower, or underemployment (alternative labeled "overeducation", defined as the discrepancy between educational attainment and the educational requirements of the job).

#### 8. The Absorption of Higher Education Graduates by the Labor Market.

Generally speaking, the output of university-trained manpower has been very well absorbed by the labor markets in the OECD countries, resulting in a general upgrading of the pool of high level skills and competencies embodied in the labor force. Until recently, the absorption rate of higher education trained manpower was even higher than that of manpower with lower level skills. This can be seen from the comparatively low rates of overall graduate unemployment which vary, however, disaggregated according to the professional field.

The degree of absorption of university and college graduates is, like the problem of mismatch, dependent on the flexibility of both the respective higher education system and the labor market for graduates. Examples for the former include academic credit and credit transfer systems, the availability of part-time study, and distance provision. Flexibility of the labor market is enhanced, among other factors, by a high degree of elasticity of substitution between university educated and non-academic manpower (which in turn is dependent on a number of factors such as entrance requirements, pay level and the number of jobs for university graduates in the public sector), and the creation of new jobs through the overall, or individual, reduction of worktime (job sharing, part-time work etc).

### 9. Demand for Highly Trained Competencies and Skills

As was pointed out above, the increased supply of highly qualified manpower has been relatively well absorbed by the labor market although the rate of absorption has levelled off in recent years. While in the 60's and 70's the public sector, including the higher education sector have accounted for the lion share of this demand, the private sector has increasingly contributed to this development, partly by creating new jobs with high qualification requirements, partly by substituting university-trained personnel for staff without academic training. Labor market experts suggest that the absorption rate will significantly decrease in the 1990's as both in the public and the private sector a certain degree of saturation has been reached in the interim, so that the number of jobs will remain relatively stable and new recruitments will only be made in order to replace existing staff. Due to relative young age structure of present holders of such jobs with high qualification requirements, it is predicted that supply of university graduates will largely exceed the demand.

On the other hand, the evidence from recent research suggest that the penetration of all economic sectors and, in fact, of almost all facets of society as a whole, by the new information and communication technologies will dramatically increase the level of compremency and skill requirements on all levels of jobs. While such increase in skill requirements is seen especially in those economic sectors that compete world-wide for market shares, it is maintained that this development cannot be limited to these sectors but will, with varying degrees of time lags in the respective sectors, become universal. This assesement would suggest that the general trend towards a general upskilling of the workforce would continue and the share of higher education trained personnel would continue to grow. To a considerable extent this would depend on the hiring patterns of medium and small enterprises the vast majority of which has no tradition of, and therefore often reservations about, working with academically trained personnel. In order to overcome this reservation, specific policies are in place some OECD countries that are aimed at enhancing graduate employment in medium and small enterprises.

### 10. Changing Patterns of Research and its Application.

In most OECD countries, traditional basic research, which outcomes are both long-range and unpredictable, is considered the most important task of

universities. But there is a **number** of new conditions that tend to relativate this primary emphasis of basic research. Among these factors are :

- Rising costs of research, particularities in the physical and biological sciences **which create** growing pressure to concentrate limited funds in a few institutions only ;
- The growing internationalisation of **research underlines** the need for quality and excellence and, therefore for concentration and choice ;
- Growing demand for applied research and development.

This need for the increasing preoccupation of universities with applied R&D is enhanced by a number of facts :

- The time gap between basic research and its application has in many fields become so short as to reduce or even eliminate the distinction ;
- Increasingly, technology is driving science through the developments or a new instrumentation ;
- More generally, the economic vitality of modern advanced societies depends on a continuous flow of technical innovation and advance which creates a demand for closer and more permanent relationships between the research, development and application phases.
- Finally, and more fundamentally, in the light of the growing complexity and relationship of knowledge, information and the glut of data, it is felt that universities must also play a vital role in the aggregation, synthesis and interpretation of this knowledge, information and data. It is here that the need for more interdisciplinary research must be emphasized (for reference: in the **United States** the National Register of Scientific and Technical Personnel registers over 900 distinct scientific and technical specialisms (outside the humanities and social sciences), compared with only 54 twenty years ago).

#### 11. Knowledge and Technology Transfer : Towards New Forms of University/Enterprise Relationships.

Increasingly, the economic importance of new products and production processes based on advanced science and technology has come to be recognized. New science-based industries are considered a source of economic growth and employment, and have been attributed the role of the engine of economic train. As industry moves into new areas of advanced technology, it is developing a growing dependence on the science and engineering base. This has led corporations to develop new and stronger links with universities which take a variety of forms, such as joint research contracts, joint staff, agreements on the utilisation of equipment etc.

While co-operation between universities and large corporations is generally no problem, there are often problems in the relationship between small firms and universities. While large enterprises have highly trained personnel and often R-D departments of their own. Small enterprises often do not know the R-D potential of the universities and the way how their particular problems can be translated into the appropriate scientific language. A further obstacle that is in the way to a dialogue between small enterprises and universities is the organisational structure of the latter : while small firms have problems-often a mix of technical, organizational, marketing, management or training problems , universities have specialized departments. Thus, the problem of disentangling firms, problems and clearly defining them can often not be resolved without any special assistance. Such special assistance requires a variety of services, such as

- information about the R-D potential of the universities ;
- analysis of the enterprise's research needs, its definition in a language intelligible for the researcher, and the research for, and matching with, the appropriate research department ;
- analysis of the firm's needs for highly trained personnel and assistance in finding appropriate graduates or young researchers ;
- analysis of the firm's training needs and brokering services concerning the appropriate continuing education and training courses (university provided or not) ;
- support for university graduates and researchers who want to market their R-D product, (spin-off founders) including assistance in finding venture capital or experienced business partners, and practical help in setting up business.

While some of these and other services are being provided by independent institutions (such as the chambers of trade and commerce) or private consultants, others can be, and in fact are in most OECD countries, provided by special departments or offices of the universities (e.g. liaison offices, science parks, extramural departments of adult education and trainings).

## 12. Science and Technology Assessment and Acceptance

While the ongoing structural change is the cause for major disruptions and imbalances concerning national and regional labor markets, its effects are not limited to large scale unemployment on the one side and serious shortages of skill manpower on the other. Of equal importance are, although less conspicuous, far-reaching changes in the work place due to the installment of advanced machine systems and equipment that have an effect both on the way work is organized and on the qualifications of the employees. The introduction of new technologies on the shop floor and in the offices has therefore seen and continues to be, a concern on the part of workers and their representatives (unions, work councils).

Much of this concern has led to various degrees of resistance, occasional labor disputes, down time, of equipment, and overall suboptimal use of the new systems.

A principal factor for these phenomena is the fact that workers or their representatives are neither actively involved in the planning of the introduction of new systems to the firm nor informed, in any detail, about the repercussions of this process for their jobs, its content and organisation as well as their skill base and responsibility.

As a consequence it has been realized that large scale technological innovation in the work place must be accompanied or preceded by an assessment of the effects of these technical systems and that the appropriate involvement in, and preparation of, the workers concerned is the most important factor influencing workers' acceptance and, hence, willingness and ability to work within the new framework. It is thus not sufficient that new machine systems and equipment are highly sophisticated from an engineer's point of view but that they are understood in its functioning and effects and accepted by those who are to work with and put them to an efficient use. The task of technology assessment and the evaluation of its effects is interdisciplinary in nature and largely a domain for the social sciences. Thus, whole natural and engineering sciences are the driving factors in the process of technological innovation, the pace and the success of this process is dependent to a considerable extent on the contributions of the social sciences.

## **V. The Maintenance of High Level Competencies and Skills.**

### **13. Half-Time Value and Obsolescence of Skills**

Since scientific knowledge, it was pointed out, is growing at an exponential rate, much of the existing knowledge is becoming dated and eventually obsolete. This process of generation of new and concomitantly, obsolescence of old knowledge occurs at a different speed in the various disciplines. Natural sciences and engineering are particularly affected. Thus, it has been estimated that the half-time value of the knowledge of an electrical engineer is about 4 years. While a period of 8 years may be an untypically short span for the turnover of a complete body of scientific knowledge it is becoming increasingly that in many if not most, other disciplines the knowledge and skills initially acquired are no longer sufficient for the entire span of a professional's work life.

The same is true for middle level work skills that do not require academic training. While a whole number of traditional professions has disappeared and new ones have emerged over the last two decades, some of existing ones have changed a good deal of the skill base required for its exercise.

### **14. Skill Maintenance : Policies and Practice**

As a consequence of the changing knowledge base, the need for recurrent maintenance of professional knowledge and skills has become to be widely recognized.

While in many fields professionals with academic training have the habit of keeping abreast with the scientific advance in their respective discipline, mostly through self-study, in some countries licencing boards or professional associations require the proof of regular and formal updating as a prerequisite to continuing professional practice.

National policies are in place in some countries to enhance this process of knowledge maintenance through continuing education and training. Examples include subsidies for institutions that offer special courses for professional updating, various financial (tax) incentives or, on the other end of the scale, the imposing of special training taxes. An example for the latter is provided by France where firms with more than 10 employees are required by the law to spend 1,1 % of that respective wage bill on continuing education and training of their workforce.

#### 15. Continuing professional training - A New Mission for Higher Education.

In view of the fast-growing body of knowledge and the need for university-trained manpower to undergo recurrent continuing education, universities must be expected to assume the providing of specific refresher and updating courses for adults. While some countries have a long-standing tradition of extra-mural provision, in others universities are not yet engaged in large-scale continuing education, leaving the task to the non-academic adult education sector. However, in all OECD countries, policies both on the governmental and the institutional level, have been recently developed to promote continuing professional education through higher education. Indeed policy makers and institutions alike, tend to regard professional continuing education as one of the central missions of universities and other higher education institutions, being of equal importance as the traditional tasks of research and initial training.

### **SUMMARY**

The training of highly qualified manpower is an essential factor in the process of economic development. Yet alone is not sufficient. It must be accompanied by the transfer of the knowledge and skills embodied in the R-D personal and the higher education graduates into society as a whole. Thus, the absorption of highly trained manpower by the labor market and their efficient utilisation is an important element in the process. Likewise for R-D to be relevant for economic development, mechanisms must be developed and strengthened to facilitate the transfer of scientific and technological knowledge from the place where it is generated (universities) to the place where it is applied i.e. made into a marketable product (private sector or state-run production sector). Finally, given the fast rate of growth of scientific knowledge, the initial training of a highly qualified workforce is not sufficient for its members to stay highly qualified throughout their worklife. Rather, universities and other higher education institutions must assure continuing professional updating and training as a new mission, of equal importance as research and initial training.