



REFLECTIONS ON HUMAN-CAPITAL, UPPER EDUCATION AND SOFTWARE INDUSTRY

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Abstract

In this paper, the human-capital is presented in relationship with the educational system and, also, with the labour market and the software enterprises needs.

The problem is analyzed in several other countries so that to can compare it with our particular local situation.

It is discussed an approach focusing on measuring the human-capital. Suggestions are proposed to sustain and improve the human-capital in the software industry cluster.

Finally, the conclusions are presented, in particular, those that highlight the necessity of a transversal strategic plan in order to improve the human-capital in the high-school, tertiary and university level as well as in the software industry area, in Argentina.

1. WHAT DO WE UNDERSTAND BY HUMAN-CAPITAL?

There are several definitions about human-capital. The one we choose in this paper is:

Intangible capital's expression that include population's knowledge and population's intellectual abilities, especially of the worker population, which have been acquired by educative and qualification's processes, which make possible the supply of capacities and services for a company or institution.

The human-capital has an important role in the economic growth process and individuals possibilities in the labour market are joined with the educative level they have reached [1].

In the human-capital theory [2], schooling is seen as an investment decision. One assume that individuals continue in the educative circuit until the point in which the present value of the expected benefits of the additional schooling are equal to it's direct or indirect costs (for example, tuitions, future incomes). One assume that education increases people's productivity and that workers with better education are, then, those who can get higher salaries, under the hypothesis that the work market is perfect and that the work is paid to it's marginal value.

The celerity in the creation, dissemination and access to the knowledge has caused the sensible shorten of intervals between knowledge generation and the practical applications of such intellectual creations, which hit sensible in individuals life. Another evident phenomenon is the fast growth and development of computer science technology, which aids in an essential way to the verification of the phenomenon previously enunciated.

Finally, the diminution in the communications costs brings a change at the economic activity disposition. In particular, intangible products such as education, investigation and software can surpass certain tangible products. That's why the promotion and investment in innovation as well as in higher education become very important resources for the economic growth of a country. In particular, in the software industry of our country, high levels education developments, with a theoretical and practical preparation to the higher level students, as well as to the active professionals or to those that could be reincorporated to the labour market, become a key need.

The Chinese culture has a tradition of placing a high premium on learning and on continuing education. From the ancient times they affirm that an individual will never has to stop learning along his life.

In a country such as the Republic of China [3], to establish an effective life long learning system, it's necessary to expand preschool education, universalize primary education, strengthen secondary education, diversify higher education, and improve the labour training market to provide more learning opportunities. In our country, we could review all these scopes to contemplate them at the integral strategy of extension and improvements in the own system.

In the case of Portugal [4], there is a beginning to overcome the low levels of education of the labour force. It targets both school-age children and adults. For school-age children, the goal is to increase school enrolment via the diversification of the education streams, so that to have half of the upper secondary students enrolled in professional or technological education by 2010. The main lines of actions are to:

- ✚ Implement the plan to reduce learning failure in basic education so as to increase the number of young reaching the upper secondary education.
- ✚ Increase the supply of professional courses.
- ✚ Develop a system of information and career guidance to facilitate student's decisions.
- ✚ Improve and coordinate the management of supply by the Ministry of the Education, the Ministry of Labour and Social Security and private entities, so as to increase equity in coverage and efficiency.
- ✚ Reduce incentives to enter the labour market for those under 22 years who have not concluded upper secondary education.
- ✚ Review the financing model for professional schools to ensure equitable access and eliminate distortions.
- ✚ Develop a system of quality certification.

For adults, Portugal has thought actions such as the following:

- ✚ Increase the supply of educational and vocational courses.
- ✚ Expand the network of Centres of Recognition, Validation and Certification of Competences.
- ✚ Increase the supply of basic training for all adults.
- ✚ Facilitate access to training for workers by adapting the organisation of training courses and the financing of training costs so that the current and future competitiveness of the companies is not affected.

India is also worried about the human-capital improvement. The main lines concern about [5]:

- ✚ Improve the efficiency of basic educational services by optimizing the global expenses so as to obtain an improvement in the quality of primary and secondary education. In particular, increase teacher capabilities and responsibilities establishing both appropriate salaries as appropriate incentives to give a premium to performance and quality.
- ✚ Improve participation of disadvantaged groups through providing special intervention: assigning efforts to target the poor and socially excluded groups should be enhanced, ideally through programmes that are self-selecting such as those that offer cash payments for participation among the worst-off groups, especially in the poorest states, so minimising the need for quotas.

In our case, we can consider appropriated the approaches adopted by these countries referred to the improvement of the human capital, adapting to our reality great part of the proposed actions.

2. POSSIBLE METHOD FOR QUANTITATIVE ANALYSIS TO MEASURE THE HUMAN-CAPITAL

De la Fuente and Jimeno [6] show a framework that combine the discounting method with the wage estimation and other premium in the labour market, taking into account the worker training and the worker education. It becomes interesting the number of factors that have been combined in order to construct comprehensive measures of benefits flow and costs of education.

This approach considers that labour market incoming is once an individual has completed his studies.

Once an individual has found a job, he begins to earn a wage that is an increasing function of the time spent in the schooling or education process. It is also necessary to consider the

payment of certain rates, (i.e. private schooling or travel to urban centers that offers the possibility of realising the wished studies). It's also assumed that the amount of working hours doesn't depend on the amount of successfully completed years at school.

The unemployed workers have some unemployment benefits out of the work which could be affected by certain taxes.

When individuals reached the end of his active life as worker, they begin earning a pension which represents a constant fraction of the last income perceived, which could also be affected by certain taxes.

This framework assumes there is an additional year of schooling for an individual, taking into account two reasons:

- ✚ The net wage increased per hour for a level of worked hours.
- ✚ The increase in hours really worked, as a result of a greater possibility of finding a job for a given wage level per hour.

Whereas the additional earning gained by schooling becomes constant along agent's life, real earnings grow at a constant rate, according to the described model. The real earning depends, as much as technological progresses, as of experience accumulation.

It is supposed that an agent chooses his optimal schooling level, maximizing the earning present value after taxes, during his expected life time, net of the direct costs generated by education.

For the precise calculation of inversion return as a result of completing tertiary education, it is necessary to compare the marginal benefit of an additional year of tertiary education with its marginal cost; named the TIR, which is the discount rate that equates the marginal benefit with marginal cost.

Marginal benefit derived from education can be classified into three:

- ✚ The extra pay is defined as the net increase in salary as a result of an additional year of schooling and continuing to maintain a constant probability of employment,
- ✚ Increased ability to obtain employment, which is due to the increased likelihood of employment associated with an extra year of schooling, keeping wages constant,
- ✚ Retirement bonus, ie the present value of retirement benefits due to higher salaries for a larger life of the agent and the probability of obtaining employment because of the extra year of schooling.

The marginal education cost is given by two components:

- ✚ The opportunity cost of schooling, ie, future earnings and experience in the labour market due to the greater number of years of schooling and
- ✚ The direct cost of schooling, mainly tuition and other costs incurred during the enrollment agent.

Other assumptions that De la Fuente and Jimeno [6] in their approach and to consider whether to apply to our case, are:

- ✚ The extra salary or prize is a growing and invariant over time, successful in school,
- ✚ The extra salary or prize as a result of the experience gained is constant over levels of schooling. It is supposed to be a function of potential experience over the years and reported employment growth rate constant in time,
- ✚ probability of employment is an increasing function and invariant over time, in school,
- ✚ The time of life, is present in the labor market is the same throughout all levels of schooling.

In this paper we consider that it would be more interesting to generate local data o regional data (i.e. MERCOSUR), besides going to data sets that can offer international organizations such as OECD, World Bank, OMC and other institutions or forums. Oliveira Martins et al. [7] show that implementing political that increase education returns isn't the only measure to consider. Also it will be necessary to consider the financing restrictions that must face students and that have an important role in the national level determination in human-capital investment. In particular, we added, the education system will have to give clear signals of good returns in education so as education investment can be performed. We also think that the government must take care of the minimum needs of families with their members available for education or training, so that these tasks can be performed with dignity.

On De la Fuente and Jimeno [6] proposal, and in the context of our country, it should be noted that the labour market in the software industry, is not evident that a person ends their tertiary education or university before entering the job market. Quite the opposite, and this

becomes a threat to the students that many times or are severely delayed in her career, or drop out, staying in a level in which only the increase in their experience and hours worked, can make his salary and other conditions related to work become better. In our country, for the unemployed, there is no systematic protection of dignity for those who are outside the loop, nor a strategy of re-integration into the circle of work.

3. PyMEs IN THE SOFTWARE INDUSTRY AND HUMAN-CAPITAL

The Chamber of Informatics and Communications of the Argentine Republic (CICOMRA) and the consultant Prince & Cooke, had elaborated a study about human-capital in the cluster of enterprises of informatics technology communications and the call centres of our country [8]. In the mentioned study it's informed about the employment level at the end of 2007, calculated in 160.000 persons working at enterprises of software development or informatics services and a total of 310.000 agents doing jobs concated with the informatics technology, both on the private and public area.

Until the year 2006, in agreement to the same study, it was noticed that actives human resources in TICC (Technology Information, Communication and "Call Centres"), the 68% of the agents had completed the university or tertiary education level.

The same study affirm that the "whole of 283.915 employees registered in 2006, will reached an estimated number of 310267 at the end of this year. It's thought that this increase will continue in a rate of 8% annual, reaching to 365.031 in 2009." [8]

In the same report it's also pointed out, that the actual educative system condition, with regard to the tertiary and university levels, will not be able to satisfy the next years demand, at least in its present performance conditions and with the professional and technical profiles which had been defined as criticals (programmers, technical support, net administrators, computer sciences engineers or licentiate in information systems or in computing).

In this paper we would also add, as a profile to cover, that of the specialist teacher in information technology and communications in all the educative levels, beginning with the maternal garden.

The experience from the Faculty of Engineering of the University of Buenos Aires (UBA), indicates that more and more earlier during the studies, students are hired to perform many of these profiles in both PyMEs and large companies, particularly transnational companies, which recently are being established in our country, attracting human resources and causing massive difficulties for PyMEs in the labour market.

With reference to Chudnosky and Lopez [11], "the SSI sector has been experiencing a strong momentum worldwide in recent decades. Predictably, this dynamic will continue in the coming years, considering that the area of SSI is closely linked to the massive expansion of ICT (information and communications technology) at the global level, which in turn is the heart of what is has termed the "new economy".

Another interesting conclusion in this paper, emphasizes that the software industry and informatical services "is relatively few intensive in the use of capital", referring to the capital in the classical sense and added that Argentina is one of the countries "where there is an significant accumulation of human-capital available". For these reasons, it is strategically important the development and optimization of this genuine or potential resource of our country.

Regarding the role of training in relation to the company, employers should bear in mind that adopting new cultural patterns is the result of a specific project and sustainable over time, with the low effectiveness of actions discontinuous and isolated. To achieve this, it is necessary to establish plans for development in the medium of the human capital of the company, ensuring the development and availability of human resources needed for growth and competitive development of each enterprise. We could start focusing more intensely on the role of human resource management, the focus to these objectives, programs and strategic plans, which should be strongly supported by top management.

As the State's strategy to be adopted to begin to address gaps and other problems highlighted here, you should consider cross-cutting areas of work such as education at all levels, business, industry, trade - local, regional, national and international, social needs, technological infrastructure, the labour market. In particular, the government should be able to effectively facilitate better knowledge management by establishing best practices that encourage innovation, avoid duplication and consequent waste of resources, encouraging research and development of rich and innovative learning resources for all levels learning cycle (from early childhood to

advanced adulthood). For example, carrying out a concrete and clear action on any measurable progress and applications for e-learning. Highlights some characteristics that could contribute to the success of development in quality and quantity of human capital, inspired by [9]:

- ✚ Establish flexible programs to help unemployed adults and workers to access training in order to climb the job market or enter it,
- ✚ Promote, through incentives, participation and private sector investments,
- ✚ Modularized education both academic and vocational, propitiating that certificates or credits are transferable across the different national institutions and with our neighboring countries. This means that it will have to be ensure a common minimum base that enables such mobility,
- ✚ Sustain and strengthen the learning based on training, experience and applied knowledge, from the pursuit of theoretical knowledge
- ✚ Coordinate training programs designed to address needs in the short, medium and long term sustainability of the industries, which enable us to allow or be more competitive in the international market,
- ✚ Increase participation of current and future technological poles in our country, offering activities not only of product development but also development of human capital that could spill across the region
- ✚ Establish intelligent connections between educational authorities and industry, trade, social, communication and production processes for the implementation of integrated education and training,
- ✚ Establish quality standards for providers of education and training as well as the process of measurement and verification of such standards.

As María Antonia Gallart suggests [10]: "Technological change and productive restructuring are part of a complex process of creation and destruction of occupational niches, and growth and failure of business initiatives, which are combined in a complex tissue, which is inserted in the majority of the workforce".

4. CONCLUSIONS AND FUTURE TASKS

- ✚ Providing Argentina is a geographically enormous country (second in extension in South America and eight at the world), with very long distances between some of it's habituated places and with small population (39.356.383), compared with the ones of Japan (126.974.628), Corea del Sur (48.324.000), China(1.284.303.705) or India (1.045.845.226), a principal strategy World be to develop the intellectual capacities and human-capital in general, transforming country's population in a competitive advantage by the implementation o fan economic growment model based in the knowledge of every one of it's residents, it means, a model knowledge-intensive.
 - ✚ In difference of the proposal by De la Fuente y Jimeno [6], for the more adjusted calculation of the TIR, in our country should be contemplated the students who work part-time. By this, for a good measurement of human-capital in countries where this happens, it is necessary to recollect enough and exact data of this kind.
 - ✚ An obligated change of measurement focus of the human-capital presented, particularly in the estimation of the TIR and so that it's of utility at countries like our, is to consider the average of scholaring ages of the population instead of considering only that population which has concluded with the secondary school.
 - ✚ The continue, articulated and qualified education along all citizens life Hill give more opportunities for learning and capaciting, being more competent for the adaptation generated for the innovation, technologic advances or the new jobs which could appeared at the labour market.
 - ✚ Although in last years there has been an actualization of telecommunication infrastructure in our country, it's necessary to put more vehemence at the efforts of it's expansion along all the country, and so with the technologies of modern information and communication put at the service of all people training. Particularly it would be convenient the implementation of satellites which will become more popular and cheaper the broadband Internet access so that to improve the efficiency in population education, learning and training. A way in doing with this would be to have resources and facilities to generate PyMES which will be destined to develop this kind of modern technological resources.
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- ✚ Elaborate an strategic plan of investments of short, medium and long time for the improvement of human-capital. The efforts not integrated or coordinated in this way, causes detriments at the use of financial resources dedicated to promote the learning, the education or training. The fact is to integrate the efforts of educative institutions, private enterprises, no government's organizations, social organizations, communities and the government to optimize the coordinated effort and the assigned resources.
- ✚ The proposal is to analyze possible knowledge and training's profiles which satisfy national and regional (MERCOSUR) necessities to get easier the mobility of technical's and professionals both to work and to continue learning and training without formal or structural obstacles.
- ✚ Elaborate an efficient program of incentives for the public university and for the enterprises, that implement continue education for active adults, it means with work, and for those who are out of labour market.

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