



The Double Helix of Learning and Work*

Orio Giarini

Director, The Risk Institute;
Member, Board of Trustees, World Academy of Art and Science

Mircea Malitza

Founding Member, Black Sea University Foundation, Romania;
Fellow, World Academy of Art and Science

Editors' Note

The Double Helix of Learning and Work by Orio Giarini and Mircea Malitza is a report to the Club of Rome first published by UNESCO in 2003. It advances fundamental paradigm-changing ideas in the field of education. Drawing inspiration from the double helix structure of DNA, the authors seek to strengthen the relationship between education and employment in order to bring 'The Knowledge Society' within reach. This article is an abridged version of the last chapter being published in *Cadmus*.

Chapter 5

“A Call to Action”

5.1. All the Ingredients are Available

The solution to the problem of Learning and Work is likely to emerge from the existing elements. It might be the following: the modularization of the curriculum with the aim of creating a personal choice system to be constructed by the individual along his or her active life, between the ages of 16 and 76, to consist of alternative sequences of work and learning. At the dawn of the Twenty-First Century, a vast number of experiments, debates, and initiatives are underway and are aimed at devising solutions to the problems of education and work. The problems in question are also being given priority on governmental agendas. International organizations are focusing on them. Both the pressure of public opinion and the rapid pace of technological and economic change are calling out for solutions. The relationship between education and work is being followed, with great concern, by private companies, and it is catalyzing the involvement of civil society. The main issues for reflection are listed in the table below:

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Education and Work: The Principal Issues

Education	Education and work	Work
Curriculum reform	Assessments	Employment
Modularity	Indicators	Active knowledge
Shift to learning	Financing	Non-monetarized work
Optional and choice	Education for work	Non-monetized work
learning	Job-oriented education	Participatory work
Lifelong education and	Public and private	Inclusion in management
learning	Knowledge	Part-time work
Interdisciplinarity	On the job learning	
Formal, informal, non-	IC Technology	
formal	Adult innovation	
Imparting knowledge	Recurrent education	
Anticipatory learning		
Participatory learning		
Distance learning		
Open institutions		
Education for all		

This list of themes regarding education and work is about as comprehensive as possible. The evolution of the concepts in question and the degree of their recognition are also important. Who would have guessed that the aspiration of humankind to permanent education would give rise to a concept that would become an official programme (*i.e.*, lifelong education)? In the world of politics, bulky chapters are devoted to such items in the electoral platforms of various parties. National and international meetings are tackling these issues more extensively than ever before.

The relatively complete agenda of lifelong education and the energies dedicated to the analysis of its implications are aided by an additional fortuitous circumstance. The debate is not only theoretical, but also action-oriented. It has gradually embraced each and every component of the solution. All the ingredients are now present. Among the myriad experiments, there are some that asymptotically come close to the solution. The overall picture is still in a state of flux, waiting to be crystallized.

Either of the two parts of the helix have multiple exits and points of entry. Transit takes place within a common assessment system, based on cumulative credits and on a funding framework resulting from co-operation between the public and the private sectors. And yet,

the solution is not there, and the coagulation point remains beyond reach; moreover, further progress is currently slowing down. The saturation of the mixture is leading to dysfunction.

Thus, the stated and acknowledged objectives tend to turn into empty rhetoric. The proponents of the idea soothe their consciences by delivering noble speeches. Experiments do not advance because of a lack of communication. They appear as isolated spots in an indifferent mass, held to ransom by traditional routines. The acquired expertise moves in closed circles, the case, for instance, with modularization in vocational and postgraduate education.

In almost all cases, experiments amount to *ad hoc* additions to the mainstream curriculum (a little bit of genetics in secondary education, more civic culture, visits to or practice in industrial enterprises). Teachers seem to treat these activities with condescension and tolerate them providing they do not interfere with the system of class-teacher one-stream curriculum.

Even when solutions meritoriously address previously neglected problems, they are mostly inefficient, if not downright wrong.

Let us take, for instance, the question of children with special needs. The old terms bearing a connotation of exclusion (*e.g.*, handicapped or disabled) have been abandoned. A step forward was taken at a conference held in Salamanca in 1994. It stated a valid principle; those children have to be integrated into the regular system, considering that normality should be construed as recognition of human diversity, and that children with special needs should not be confined to institutions and marked as unable to live a normal life. Steps toward integration into the regular school system have already been taken, and the teachers have been instructed to extend adequate treatment to all children. Nevertheless, integration within a system with a single curriculum may give rise to greater problems than those encountered in special schools. Discrimination will, in fact, be eradicated only when each pupil is able to have an adequate curriculum adapted to his or her specific situation and needs. In the light of the personal curriculum solution, all children are special, and each one has special needs.

The integration of minorities has been and still is being seriously considered by sociologists and government agencies. To quote a representative of a minority group, "integration is another name for assimilation". Even so, a personalized itinerary provides solutions such as choices of modules relevant to the community language, history, customs, and beliefs within the general framework of the educational offer.

In that perspective, the issue of non-discrimination finds a natural solution. The idea was tenaciously pursued at the end of the Twentieth Century through official programmes aimed at *Education for All* which simply implemented the provisions of existing international agreements starting with the Universal Declaration of Human Rights. Since the notion of an individual itinerary applies to everybody, it eliminates any source of discrimination. The *Education for All* programme is not limited to the elimination of discrimination from the educational cycle; it also points to the inclusion of all age groups, at least through age 76. In this vision, curricula should be based on modules for all the periods of a person's life. A possible, but yet unexplored, result could be an extension by twenty years of the productive life span of the adult generations.

The multiplication of optional subjects at all the levels of the educational system can be regarded as an encouraging early result in this process. It reveals the capacity of the educational system to renew itself through cooperation with the community, with parents, and with interested companies. The decision-makers now have to catch up by drafting new laws and introducing systemic modifications into such areas as evaluation, diplomas, and financing schemes. We are witnessing the first signs of flexibility in an effort to come closer to the individual by enabling him or her to exercise his or her essential faculty, that of free choice. Enhanced flexibility is required when it becomes necessary to tackle the more sensitive areas of education.

Many reformist trends around the world have approached the issue of education for work. Special classes were allocated to visits, mostly passive ones, to workplaces in factories and service enterprises, to institutions of public administration, to hospitals, and even to the traffic police. As a result, students became more aware of, and more familiar with, the reality of work. At best, those visits awakened in them a certain interest or vocation. Entertainment and sports have, so far, been more successful in offering attractive heroic models for the young. So have other models of shortcuts to wealth, fame, and prestige, leaving behind the doubtful fascination of work.

A possible experiment could focus on the introduction of occupational modules for children aged 10 to 16, with more advanced levels for students over 16, focusing on such occupations as: electronic engineer, programmer, graphic designer, nurse, salesperson, tourist guide, gardener, farmer, etc. The list is endless, and it coincides with the standard record of professions. Why should recommended hobbies concentrate only on such activities as the breeding of birds or of rabbits? Should a greater degree of free choice not make a young person happy to have earned a professional diploma by the age of 15? Basically, the idea is to gradually assimilate amateurism and hobbies within the curriculum, thus providing a pleasant and attractive introduction to the sphere of work.

Non-formal education and informal education no longer need theoretical recognition, but they remain largely unexplored even though they are attainable with modest means. Where are the “Do-it-yourself” shops which would enable young people to get tremendous satisfaction and pride from having built, from detached parts, their own radio sets, portable sound recorders, home appliances, mosaic-covered tables, computers, etc.? Where are the modules for the organization and equipping of a personal science laboratory (physics, chemistry, natural sciences)? While the schema of modular education is bound to give rise to new industries, such as the module industry, the new concept calls for the establishment of an auxiliary industry producing the wherewithal for informal activities.

It should be noted that all the topics that are being explored by educational research today—formal, informal, and non-formal learning, open and distance learning, recurrent education, optional choice, and modular learning—are increasingly relevant for that area of lifelong education which addresses the adult person.

The promise that learning through experience holds for scientific knowledge is still being mostly ignored. Whereas experiments in the school laboratory under a teacher’s

supervision are mandatory, according to the curriculum, the value of exercises in problem solving related to theoretical subjects is played down. In fact, the exercise book is not the auxiliary addendum to the theoretical textbook but rather the other way around. The winners of contests in mathematics, physics, or chemistry will confirm this reality.

However, the most intense and perceptible change of attitude is occurring with the coming generation. Something perceptible and significant has happened, directly linked to education and work, for the structural reform of which the young could be the main asset.

Scholars doing research on the impact of technology on the younger generation (the United States provided a most appropriate field of study) suggested that, following the baby boomers, the people born in the aftermath of the Second World War, the generation of the 1960s and 1970s, have their own particular characteristics. The former, the baby boomers, bear the imprint of television and of its confusing, non-interactive influence. That generation produced radical and revolutionary youth movements. It was followed by the Y (for “Yuppie”) generation (also called the “Millennials”), children of the Internet. Children turn their backs on traditional games because of the superior interaction and sheer fun that the new environment of the Web offers them. People of the new generation are displaying unusually strong new propensities: independence, skepticism about adults, a rich imagination, and an incredible innovative power. They love change and, above all, they are entrepreneurial.

Don Tapscott, the author of *Growing Up Digital: The Rise of the Net Generation* (1998), wrote: “For the first time in history, children are more comfortable and literate than their parents about an innovation central to society”.

What should be noted is the impatience of these young people with the pace and the protocol of the conventional curriculum. They want to learn faster and better by making use of available technology in a more focused and selective manner than is prescribed in the rigid curriculum. They already are the authors, *avant la lettre*, of personal curricula. They are also impatient to jump-start their involvement in the sphere of work as soon as possible. At a time when senior citizens learn how to use e-mail and to search the World Wide Web from their juniors, young people are no longer attracted to the defiant spirit of the 1970s. They simply wish to find out more about life during that period. The much-discussed “generation gap” is not widening. The contrary seems to be the case.

It is striking to see how much respect these young people have gained in the eyes of their seniors. Adults have started to imitate youth, to dress like them, and to listen to their music. Companies want them for their technical skills and their taste for change. Governments take them along with their delegations to the United Nations. City halls set up youth councils. Political parties increasingly depend on inputs from their youth branches. Students have an active presence in the management committees of secondary schools and universities.

Some might object that this picture is that of corporate America. Yet another young generation is turning to the symbols and myths of the past. From a ludic point of view, it is fair to say that the young play the games that are available to them, even the most sinister ones. By extension, in the new century, the name of the game is the computer, not the

swastika. Despite obvious material obstacles, it is surprising how this trend is also gaining ground in the developing countries.

Let us examine the reasons why this dynamic young generation and the spirit of change that it is stimulating can be placed at the top of the list of present-day favourable factors. The experiments it is engaged in will likely decide the future of lifelong learning intertwined with work and accomplished through a variety of individual itineraries.

5.2. Slowly Getting Ready

An educational system, no matter how decentralized, needs some general guidelines in order to operate properly. These are elaborated at a national level and are expressed in laws and policies. The regulated segment includes the structure of the system, the procedure for awarding diplomas and other attestations, the standards or grades, the funding schemes, and the operational requirements of this vast public sector comprising from one-fourth to one-fifth of the population. The government is therefore the prime agent entitled to take decisions regarding the institutional framework of education and the needed reforms.

“Despite some interesting and promising developments, the inertia of the old structures and policies remains considerable.”

The private sector comes next with its practical knowledge of the actual current and future manpower requirements at company level. In fact, training for work is even older than religious education.

In third position comes civil society, represented, in particular, by parents, who have always been involved but have recently become more vocal.

The fourth essential factor is the teaching staff owing to its position in the educational system and the weight of its opinion in the formulation and application of reforms. The importance of teachers, even in numerical terms, should not be overlooked. In any country, there are about 50,000 teachers and auxiliary staff for each 1 million young people enrolled in the educational system. Most of these teachers are represented by powerful trade unions.

Finally, since it is necessary to analyze the relationship between work and education, it is necessary to note the role of the trade unions in the national economy as a whole, especially in the light of their trilateral partnership with employers and government.

The press, television, and the other media are factors that influence the debate on the future of education; however, they can be regarded as part of civil society or as part of the non-governmental sector.

One observes that a strong will for change is obvious in regard to experimental action, and important steps in favour of structural reform have been taken at that level. Such has not been the case with other major agents that are having a crucial impact in key sectors: legislation and financing. Despite some interesting and promising developments, the inertia of the old structures and policies remains considerable.

The question here is that of the institutionalized governance of states and of their parliamentary and executive systems. Central to politics is the power to decide and manage the affairs of state in an orderly manner. Consequently, all structures have to be judiciously organized: public administration, law enforcement, the military, the health system, and public education. The political mind dreams of stability and continuity. The obsession with order becomes a systemic disease that begets bureaucracy, corruption, inertia, and resistance to change. Most national educational systems have retained a certain rigidity. They still emphasize the ideas of order and regulation, and they resist the kind of modernization that is required by contemporary society and economy and made possible by contemporary technology.

“The key to effectiveness can be found only in the capacity of the system itself to absorb change in a continuous flow.”

Spasmodic attempts to promote renewal are noticeable in the shaping of the reforms promised by political parties in the run-up to cyclical elections. In fact, the commonly accepted idea of how to go about reform may be fatally flawed. The stages of educational reform should not coincide with the succession of governments. The educational system needs to be regulated by a built-in mechanism of permanent and continuous reform. Considering the pace of change, no formula can be regarded as the ultimate formula. The key to effectiveness can be found only in the capacity of the system itself to absorb change in a continuous flow.

Current educational legislation and practice lack such adaptive mechanisms for their basic components: the cast-in-concrete curriculum, the teacher-class system, and the conditionality of diplomas. Those immobile elements, plus the goal of integration into a homogeneous mass designed to serve and perpetuate an economy and a society that no longer exist, allow only insignificant, ornamental, and symbolic alterations.

Two major processes, globalization and regional integration, are now confronting states with a new agenda. The position of an individual country within the international environment depends on how wisely it manages to play its cards, to find new niches, and to identify and to exploit its competitive advantages. These requirements call for a flexible and alert educational system.

The following story may prove more enlightening. At a conference in Algiers devoted to the new international economic order, a subject that was much debated in the 1970s, a young diplomat approached Lord Ritchie Calder, a well-known Laborite author and specialist in science and technology. Said the young man: “I must ask you about something that bothers me. When the United Kingdom gave up India and the colonial empire, among the arguments you mentioned was the country’s ability to find other ways to assert its global interests. After all, Britain had been the cradle of the... industrial revolution through technology, science, and knowledge. And yet the dream shattered once the young brains of the realm started their migration to the US.” Lord Calder replied: “The answer is simple. Education did not keep pace with the times. Universities did not understand what was at stake. School prevented us from moving forward”.

Today, states are beginning to realize that they cannot ride the waves of globalization with fixed, non-adjustable sails. Another good sign is that no nation seems inclined to suggest that its own system is the best and should be adopted as a model. All existing systems are still quite far from the ideal of flexibility and radical renewal that learned international conferences have been putting forward. Some education systems, which have been famous for their rigidity, such as the Japanese system, are starting to throw off ballast.

The private sector has also been slow to rise to the challenge, but for different reasons. The financial resources of a private bank or company are far greater than those of a ministry.

The business community has two main reasons for its reluctance to get involved in matters traditionally reserved for government action. First, education has been assigned a place on the other side of the barricade, while the government was supposed to abstain from interfering with the economy. The second reason is even more serious. Profit is the motive force of the private sector. It may even acknowledge that education is a profitable exercise. But the problem is that education becomes a profitable investment only over the long term. The natural preference of capital is for short-term gain. At this point, a quotation from Lester Thurow (1996, pp. 283-284) appears to be relevant:

Consider college education as a hard-nosed capitalist might consider it. Sixteen years of expensive investments must be made before the returns begin. Approximately \$65,000 must be invested to acquire a K12 education; depending upon the quality one wishes to buy, \$80,000 to \$120,000 will be necessary to buy a college education and the sixteen years spent in school will mean forgone earnings of about \$68,000. Sixteen years of high-quality education will require a total investment of about \$250,000 per child. The risks that this investment will not pay off are enormous.... Capitalists simply don't invest in sectors where they have to commit to a sequence of investments with low returns, high risks, and falling asset values.

There is another serious consideration. Investors always take care to avoid a situation whereby their investments could give competitors a *free* ride, as is the case with public goods. The emergence of corporate universities indicates that the feeling of insecurity about the economic returns on investment in education might have been overcome. But keeping educational investments under corporate control in order to frustrate free riders may still inhibit private investment in education as a public good.

Are these good signs? Yes, if one considers the grants that some companies punctually, though not very frequently, award to universities, or their patronage of certain schools. Also yes, if one considers the significant experience of the technological parks attached to universities, which provide a prolific interface between education and companies, with enhanced chances for the education-work linkage.

Neither the third nor the fourth categories of agents (teachers and unions) that have a bearing on structural measures are in a position to offer sufficient supporting elements for positive action.

Let us start with the *teachers*. They regard themselves, rightly, as the key element of the educational system. But they fear that a new system, while enhancing their guiding function as tutors, might reduce their crucial, well-defined role as masters of their discipline, their exclusive control over the way the curriculum is covered, and their decisive power over evaluation.

“The notion of confining education to instruction and the tacit adherence of teachers to behaviourist principles, with their emphasis on exogenous control and the minimization of the endogenous resources of learning, make teachers feel comfortable in their dominant positions as wardens of the whole process.”

Teachers are the ones who award the credits and give the green light to the issuance of diplomas. The mechanism of reward and punishment is also in their hands. A possible dislocation from that entrenched position would naturally meet with opposition. The notion of confining education to instruction and the tacit adherence of teachers to behaviourist principles, with their emphasis on exogenous control and the minimization of the endogenous resources of learning, make teachers feel comfortable in their dominant positions as wardens of the whole process.

But these are not the reasons teachers would normally give for their resistance to innovation. Their objections are packaged as a campaign in defense of quality against the changes that might threaten it. This argument carries weight with parents. They attach importance to quality and good results, authenticated by diplomas and certificates as the safest way to a stable career.

It should, nonetheless, be noted that many teachers have embarked upon experiments meant to broaden the educational horizon. Also, one should not overlook the important trend—embraced by public opinion and reflected in the activities of NGOs—which proclaims its faith in the individual, in his or her autonomy and resourcefulness. The prevailing philosophy and mentality of civil society can be transposed in the area of education through the individual curriculum, the personal itinerary, and the freedom to alternate learning and work during one’s lifetime.

Although they are frequently viewed as being a part of civil society, the *trade unions* play a special role in the relationship between learning and work. Traditionally, their priorities were related to jobs and wages and, later, also, to working conditions. Consequently, they looked with some suspicion upon the educational sector because it produced people with diplomas that entitled them to automatically hold better-remunerated positions without having “real” qualifications. But unions tended to support promotion following on-the-job training, adult courses, open education, and other measures developed within the enterprise itself.

Transition to a system based on individual training is a major test for the trade unions. Such a system brings with it not simply enhanced mobility of the type advocated by liberals

in the labour market, but total mobility. The difference is fundamental. The mobility of the market is involuntary in terms of individual choice and interest, while individual mobility is voluntary and dictated by interest.

Let us assume that the unions might give favourable consideration to the new schema, if and when it is accepted by their members. However, a fluctuating mass between the two helixes may eventually deprive the unions of clear and stable support from their membership. The need to protect the rights of those who are simultaneously and recurrently engaged in work and learning will generate new forms of organization, which will require the unions to develop more complex and comprehensive activities.

At present, the agents involved in structural change are not prepared to direct their energies and resources toward a far-reaching transition in the work-education relationship. But those agents are themselves subject to experimentation. Whether they like it or not, they are constantly confronted with the dysfunctions of the traditional systems and the high costs of their maintenance and repair. They begin to realize that a new approach is necessary in order to face the demands of modernity in the Twenty-First Century.

5.3. The Counter-Aging Society: A Life of Sixty Active Years

The best indication of the success of the Industrial Revolution was the increased human life expectancy that came in its wake. It is still rising in most parts of the world.

This phenomenon is frequently described in traditional terms as a sign that society is aging. If the statement merely means that most people today live longer than they would have lived some fifty years ago, then the statement is acceptable. But, in itself, the expression, “aging society”, is somewhat inappropriate. It is first necessary to recognize that there has been an increase in the length of the life cycle, which should probably count as one of the greatest achievements of the Twentieth Century. Second, it must be observed that what is really becoming older is the notion of age itself. One only needs to refer to the European literature of the past century in order to learn how people felt at 40. It is also clear that the onset of physical and mental decline has been pushed back. In other words, at 50, 60, or 70, one is much younger today than one would have been at those ages in the not so distant past. Therefore, our societies are, in a sense, getting younger because people are living longer and better. This phenomenon can be observed in most countries around the world.

The failure to understand the situation in these terms can lead to serious errors. On the one hand, we tend to marginalize a growing portion of the population (those over 60) far too early. On the other hand, we quickly run aground in the political debate about how much and how long the younger generation should pay to support the older generations. On both counts, we find ourselves at a dead end!

In order to come up with a rational answer, it is necessary to turn the proposition completely around: Older people are younger today than they used to be in the past because the “value” of human beings is being linked to their productive activities and creative endeavours. The key social and political challenge of the coming decades will be the extent to which modern society

manages to involve people from, say, 16 to 80 years of age in the worldwide process of creating and sustaining the wealth of nations. There are already clear signs that things are beginning to move in that direction, even though the global picture is as yet far from homogeneous (Delsen and Reday-Mulvey, 1996).* It is important to recognize the good news that we live in a counter-aging society, since the change that is occurring in the structure of our planet's population is a momentous one in human history. Our culture, our mindset, and the structures of our societies must now adapt to this new and promising trend. The inescapable significance of the new situation is that every one of us has a potential for staying on as an active participant longer and more effectively than it has ever been the case. Achieving that sort of continued participation must now become the goal of the learning-work tandem and a key instrument of progress and justice for all.

"We still hold to our philosophical prejudices: we are much more what we produce than what we consume."

In this perspective, it will be essential to propose educational programmes for those who are 60 and over with an aim to develop new skills enabling them to embark on new careers based essentially on part-time jobs and/or unremunerated activities. Indeed, a great deal is already happening along these lines.

One must also consider the fact that in many countries, particularly in the developing world, young people account for a very large segment of the population. Those people will eventually grow old within twenty, thirty, or more years. The consequences of an extended life cycle will then become a truly global issue everywhere. China, for instance, has already taken this inevitable problem into consideration at governmental level.

It is first necessary to reconsider and to redefine the notion of work as productive activity in the world of today, but not in the sense of what has been inherited from two centuries of the industrial revolution. Full-time remunerated work of around thirty-five hours per week, at the least, is still considered in most cases as the only measure of the contribution of an individual to productive activity. It is through this process that one establishes most of one's social contacts. It is also at work that individuals find and define their place in society. Official forms one has to fill out on various occasions always ask questions about one's professional career, qualifications, skills, and even sex. The perception of one's personality is very much linked to that sort of factual information. One's entire network of social interaction is heavily dependent upon one's position in the world of (remunerated) work.

The fact that other human activities are hardly ever noticed has led to a perverse situation: somebody who is engaged in valuable non-monetized work—household work or child care at home are the obvious examples—receives much less than his or her due share of social recognition. Evidently, this attitude has adverse effects on personal motivation and self-esteem.

Quite a few other activities are gaining importance in a society in which leisure may sometimes occupy people at least as much as work, even though that representation is not entirely true since much of the so-called leisure time is spent on voluntary work.

* The Geneva Association, a pioneer in this important issue, had already started a research programme on gradual retirement in 1987. It has since organized at least one seminar each year on this issue and has published a series of special studies as well as *The Fourth Pillar Newsletter*.

The increased differentiation of the types of productive work and of the opportunities to perform additional activities as complementary elements of human personality is a rather new development, particularly if seen from the point of view of classical economics. An evaluation of such activities becomes a helpful tool for making judgments about individual contributions to the progress of society in a modern economic system.

We still hold to our philosophical prejudices: we are much more what we produce than what we consume. Even consumption patterns are simply ways to generate an image of ourselves. Most people, we believe, are aware of the fact that their worth is much related to their level of self-esteem and usefulness to society. We definitely stand behind the idea that we consume, and need to consume, in order to produce for ourselves and for society rather than the other way around. In this perspective, the question of work as an element of one's personality gains a whole new dimension.

To identify the current intensity of work in the life cycle we have to examine the participation rates of people in the monetized labour market. This determination is made by the ratio of the active population—i.e., all persons of either sex who ensure the supply of remunerated labour for the production of goods and services regardless of their employment status—to the total number of people in a determined age group. The higher the proportion of the active population in a specific age group, the greater their work intensity. Work intensity is subject to legal regulation, social influences, and individual decisions.

A sharp increase in economic activity occurs at age 15 to 24 as a result of graduation from secondary or tertiary education. Before the age of 15 there is usually, at least in the industrialized countries, only negligible activity in the labour market. This situation changes when mandatory school attendance comes to an end, and individuals can join the work force according to their personal inclinations and needs.

Afterwards, work intensity is more or less stable over a period of several decades. For men, the proportion of economically active people typically exceeds 90 percent, while for women, the rate tends to be considerably lower. Depending on the degree of integration of women in the labour force, the activity level, in various countries, only rarely exceeds 75 percent. During the period of activity, the participation rates of women exhibit a particular but very characteristic drop between the ages of 30 and 39. An obvious explanation for this phenomenon is the preference of women of that age to spend more time on domestic work and/or child-care activities.

At the end of this phase, the proportion of people who are gainfully employed gradually diminishes. At this time, retirement becomes a major factor in the making of personal decisions regarding working time and lucrative activities. More and more people choose to drop out of the labour market and to devote increased time to other activities than remunerated work.

We shall now propose an alternative system for the distribution of work and work intensity that seems better suited to individual needs throughout those different stages of activity.

During the education phase, more part-time work should be integrated into the official tertiary education system. Such an approach would enable young people to gain working

experience while still studying, without necessarily submitting themselves to the stress of taking an unpleasant or uninteresting job in addition to being enrolled in full-time education. At the same time, the solution would relieve them of at least part of their financial worries. The integration of part-time work into the educational system would also foster connections between theory and practice, and it would provide closer links between higher education establishments and the productive sector.

During the second phase, there would be fewer changes in work intensity. That stage, however, should be gradually phased out rather than come to a sudden end. There would be increased possibilities for older people to prepare for retirement by gradually reducing their workloads according to their individual preferences and needs. At the age of 60, they still have twenty years of life ahead of them. Gradual retirement could thus become a beneficial complement to the established three pillars of the social security system. It would also help reduce the pressures on national budgets in aging societies. Voluntary work, which is already, to some extent, being undertaken, might increase in volume. It could become a non-monetized substitute for part of the previously remunerated work since many older people would like to stay active without necessarily asking for monetary compensation.

During all three phases, education, training, and retraining should be part of daily life, albeit differentiated according to age. Constant access to education is necessary in order to enable people to remain in the labour market and to meet the demands of an ever more complex and rapidly changing society.

At this point, it appears appropriate to dispel a common misperception. Conventional corporate wisdom still claims that older workers are a burden to dynamic enterprises trying to keep abreast of a rapidly changing business environment. In fact, a number of serious recent studies demonstrate the generally positive contribution of older workers (see Warr, 1994: 472-480; and The Commonwealth Fund, 1991). They have been found to be experienced, reliable, hardworking, and effective in their jobs. They think before they act, and they seem to be more flexible when faced with new assignments and changing work conditions as compared to their younger colleagues. These very positive characteristics of older workers can, and definitely should, be exploited not only until the age of retirement, 60 to 65 years in most industrialized countries, but for a longer period. Longer life expectancies and improved health conditions make such an extended period of employment possible.

One of the major problems of the employment of older workers stems from the system of remuneration according to seniority. Traditionally, older workers have been more expensive than their younger counterparts who, in fact, have been subsidizing the higher wages of the former. This practice has led to a situation whereby older workers might be earning more than their actual productivity would merit, thus providing employers with an incentive to dismiss them, or with an excuse to shed them first in case of downsizing resulting in redundancies. The situation is even more serious in certain countries in which contributions to pension schemes increase with age, thus making older workers even more expensive.

A movement in favour of performance-based remuneration is underway in certain countries, especially in the Anglo-Saxon world, which is likely to enhance the competitiveness of

older workers. Part-time work could considerably assist the transformation of the system of remuneration, since the switch of older workers, who have reached retirement age, from full-time to part-time employment with additional, if partial, pension benefits would ease some of the financial constraints for both the employer and the employee.

However, the current distribution of income among the older population, those aged 65 and over, still does not reflect any shift towards higher earnings from part-time work.

Gradual retirement, as a complement to the established three pillars of the social security system and an expression of personal choice and individual preference, is closely linked to part-time work. Even in countries like Germany, France, or Japan, where traditional attitudes to part-time work have been predominant for a long time, the situation is beginning to change. The explicit wish of those over 60 to have a broader choice of ways to organize their lives has contributed to increased recognition of the rationality of more flexible work patterns.

So far, experiences with part-time work as the component of a gradual retirement approach are mainly positive (Delson and Reday-Mulvey, 1996). Initial organizational problems can be overcome rather quickly, and the costs of the required administrative measures, planning and sometimes equipment, are compensated through reductions in absenteeism, increased flexibility, improved morale, and productivity growth. Ignorance appears to be one of the more serious obstacles to part-time work or employment of older people, especially when they have passed the official retirement age. People tend to be skeptical whenever there is no experience of part-time work, but when that practice has been developed, it is generally welcomed by supervisors. Younger colleagues can also benefit from the valuable skills of part-time experienced workers who would otherwise not share them when fully retired.

Since the benefits of the part-time work performed by older people generally outweigh the costs, there should be no structural obstacles to the employment of older people. Current practice shows that part-time workers could undertake many more tasks than is now the case. The development of part-time work thus appears to be an ideal way of lengthening working lives and/or of giving them increased flexibility.

There is an element of absolute novelty in the relative length of working periods. The sixty-year active life tends to become generalized. An average active life increases by twenty years. Thus, the facts of demography and the leap from 55 to 75 years in life expectancy eventually come to terms with societal organization. Extended useful lives are no longer the bane of national budgets, and the specter of the “aging society” no longer seems so frightening.

5.4. Funding Schemes

How will the costs of the new system be covered? Will they be higher, as sometimes appears to be the case, or will the possible schema reduce budgetary pressures on public spending? Let us first review the relevant experiences and tendencies.

So far as education is concerned, the most debated initiative is that of the voucher system. The definition is simple: the government makes a payment to a family in the form of a voucher. The family gives the voucher to a school of its choice. Thus, the tuition fees for the

children of this family are covered. The school cashes in the voucher with the Government from the tax-funded budget. The beneficiaries are the family, especially the children, the school, and even the state.

The most important change is that both public and private schools can be chosen because the government subsidizes the schools in proportion to enrollment. Consequently, schools are encouraged to compete with one another. Only the best succeed in bringing in more students and more funding, according to *the funds-follow-the child* principle.

In fact, the voucher scheme is a continuation of the system of loans for compulsory education. It enhances responsibility towards the principle of *Education for All*. Several arguments plead in favour of this new system: (i) *child protection* following from the Education for All principle, but also providing for those suffering from parental neglect; (ii) *internalization of beneficial externalities*, since support for education reduces poverty and encourages economic growth, increases lifetime income, and has constructive social effects. One can argue that the State actually makes a long-term investment in a manner that is quite similar to the theory of human capital and the knowledge economy; (iii) The principle of *equal opportunities* is universally acknowledged and constitutionally enshrined. Children should not be deprived of upward mobility through education only because their parents are not wealthy.

In reality, most of the methods used in the voucher system are selective and somewhat biased in favour of the underprivileged categories (single parents or the disabled) and of families with reduced revenues. Other fiscal measures exist by which to attain the same goal as that of the voucher system, such as tax reduction (an education tax rebate); however, vouchers are also designed to help persons who pay lower taxes; (iv) The voucher system enhances the pool of available resources by *reducing the waste of intellectual potential*. This factor, however, does not lend itself to precise measurement. We can only guess how much is lost by not allowing individuals to develop to their full potential; (v) An application of the voucher system *challenges schools to compete*.

The new system soon encountered many objections and gave rise to heated disputes at theoretical and practical levels. It was said of voucher schemes that (i) they were generated by a free market philosophy and thus encouraged the pursuit of selfish material gains and minimized public benefits; (ii) they undermined the public educational system by reducing emphasis on quality and orienting young people towards private education; (iii) they would cause private schools to be subjected to the same kinds of controls as public schools, thus sapping their independence and specific merits and making them more and more bureaucratic; (iv) they would prevent poor families from deriving true benefits, which, rather, would go to the middle class. Segregation would thus deepen (as in the inner cities in the United States), and the educational gap would widen. Other objections pointed to the dangers of higher costs and the misappropriation of budgeted allocations, which are primarily needed by the public schools that are faced with specific problems.

The disputes over the voucher system grew even more acrimonious when the arguments turned political and doctrinal. In the United States, a country in which the debate has produced the largest number of initiatives for the adoption or the rejection of the voucher system,

it turned into a dispute between the Democrats (contra) and the Republicans (pro). Legislative action was initiated in twenty-six states.

The issue has also given rise to constitutional disputes. The United States Supreme Court ruled against the granting of subsidies from public funds to schools run by religious denominations; however, it refused to make a ruling in a parents-versus-state case on the use of vouchers. The NGOs were divided. One of them, People for the American Way, claimed that the voucher programmes weakened public education, that taxpayers' money was spent on explicitly religious instruction, and that the new system obstructed further meaningful efforts to improve the quality of public schools. In exchange, the Children's Scholarship Fund announced an interesting initiative: 45,000 privately funded scholarships for which there were 1.25 million applicants.

It would be a mistake to consider the issue only in light of the highly publicized debate in the United States and therefore to underestimate the scope of similar or related initiatives in other countries.

The application of the new system is not confined to industrialized countries.

It is now time to ask ourselves to what extent the approach was able to provide worthwhile support to the kinds of structural reform that are required for lifelong learning, curriculum itinerary, and the double helix of work and education.

First, the system is based on consumer choice supported by public funding, even though the funds are mainly allocated to maintain the functioning of suppliers. Second and most importantly, its guiding principle is personal advancement, qualification, and fulfillment. The individual decides how to use the available means in those areas that stimulate his or her interest, participation, and satisfaction, while giving him or her access to new opportunities and chances. Third, the system can apply to all age levels. Moreover, the contribution from the state budget becomes an add-on rather than a substitute to one's own earnings when necessary.

Having seen the terms of reference for lifelong education and active participation, let us now briefly examine what happens with the financing of the post-work period. States have a vital interest in providing old-age security. Pension systems are currently subject to serious debate, especially in those countries in which the aging population is on the rise.

The classical system is based on the premise that workers are taxed today in order to pay for the old people of today, *i.e.*, the *pay-as-you-go* plan. The system does not allow for a correlation of the immediately available resources and the obligations already assumed. The working generation takes responsibility for supporting the retired generation. Early retirement has only worsened the situation. The list of shortfalls is so long that the mandatory, publicly managed, tax-financed pillar for redistribution has to be supplemented with two other pillars: a mandatory, privately managed, fully funded pillar for savings and a voluntary pillar for people who want additional resources in their old age.

Such diversification is being implemented in many countries. It reduces the risks for the retired since it introduces several types of management (public and private), of financial

sources (of labour and of capital), and of new investment strategies at domestic and international levels. Since the 1970s, advanced studies have been undertaken by the Geneva-based Association for the Study of Applied Economics and by the Risk Institute concerning gradually phased-in pension schemes and chance enhancement for the after-work period of productive life.

The topic of flexible retirement plans reveals a link to the double helix of work and learning. Such schemes stretch across longer periods of active life (4-10 extra years at one end and 11-16 years at the other). The question of pensions proper will thus shrink in size and be applicable to a smaller category of people (those over 76). The additional decade will be taken care of by means of a different type of security arrangement pertaining to the right to work and lifelong education. Consequently, the contribution of the state budget needs to take into consideration a uniform approach to people aged 16 to 76, one that is related to vouchers rather than to pensions.

Two circumstances make life considerably easier for public budgets: the decreasing number of those who are relying exclusively for their living on the three-pillar pension system and a drastic reduction of the complicated and cumbersome unemployment benefits schemes. The latter will eventually become part of the social security safety net, usually applying to people who have become marginalized or incapacitated. The blurred distinction between the public and the private sectors, already instituted in the field of education, turns into a partnership for the management of the education-work system for the period between ages 16 and 76. The main contribution of the private sector will no longer come from taxes collected into a general budgetary system but from targeted investments in knowledge creation.

Education, unemployment benefits, and pension schemes are all based on taxation accounting for a staggering proportion of GDP. If one adds to that sum the expenses incurred by companies to cover social demands other than wages, the resulting figures become really huge. Hence, the conclusion that the introduction of the double helix concept gives rise to a financing system of "lifelong basic rights" which emphasizes the duty of society to provide individuals with entitlements, that will be much less costly than traditional ones, owing to its unifying vision, common mechanism, and synergetic approach.

Its advantages are much more diverse. More flexible and cost-effective formulae are emerging everywhere. The R/D perspective is a clear case in point.

5.5. Assessment

Each system has its merits. Daily assessments, a system of incentives, and a final grading scale (from 1 to 10, or from 1 to 20, ratings from unsatisfactory to very good, letters from F to A) are used all over the world in primary and secondary education. A cumulative system of credits, without differences in terms of quality, should become predominant in universities.

In order to achieve integration, lifelong education should have its own single financing system, with no differences at the ends or in between. The credit system offers relevant services. A person can gain points without interruption, thus obtaining impressive continuity in

his or her learning activity. In fact, credit accumulation should not stop at the end of one's active life (at age 76), it should continue in third-age universities.

If one considers a credit average of forty points per year of study for those involved in learning or learning for work and assume an additional eight years of college and university through age twenty-four, one will obtain a total of 320 credits. Let us further assume that, after fifty-two years of active life, mostly spent in industry or in small business, or even in front of one's own computer at home, an average of five points can be assigned to those who leave their work environment to return to the Alma mater system of continuous education. Doing so would account for another 200 credits. The equivalent of another five years will be dedicated to on-the-job training, adult learning, or to courses organized by the company (a plausible hypothesis if one takes into account the fact that the updating of knowledge requires at least one year out of five, therefore 10 out of 52).

Here is a possible credit accumulation for a 75-year-old individual: 320 plus the 400 credits obtained through lifelong learning yielding 720 credits.

Another nearly 300 credits are available for those who are more ambitious. According to one's voluntary choice and spontaneous interests (political science for engineers, aesthetics for doctors, hobbies for workers, mysticism for psychologists are examples that can function in any combination), a learned subject might yield as many as 1,000 credits. That total would correspond to 1,000 modular subjects, 1,000 weeks devoted to lifelong learning, or twenty compact learning years. Is this a great deal? Should not the pride of having collected 1,000 credits be as justified as the awe or envy one might feel toward a successful millionaire? Why should the wealth of knowledge mean less?

Those who will be called upon to develop in minute detail the open system that is painted herein with a wide brush will have two major issues to debate and resolve. One pertains to the passage from one helix to another. The traditional system currently responds to a simple demand: the graduates of medical schools become physicians; the graduates of the Polytechnic University become engineers; those graduating from schools of public administration become civil servants; the graduates of vocational schools become workers, etc. As the system becomes less specialized—inversely proportional to the specialization freely chosen by the individual, which provides a wider range of diplomas and qualifications—the sheer number of credits is not sufficient to warrant leaving an educational system in order to enter a work system.

Adequate symbols may indicate the nature of the covered modules: E or L for the basic or generally valid ones (what is sometimes called general culture or *stadium generale*) or EW for those oriented towards an activity in the sphere of work. The latter may contain an indication about the predominant speciality according to a catalogue to be elaborated together with the decision-makers in the field of work. For instance, AERO Eng. designates a profession but also the necessary knowledge to practice it, *i.e.*, aviation engineer. Such a solution will throw more light on the complicated issue of the relevance of diplomas, a subject that today is being attacked from all sides. The supple mechanism of *joints* (entry-exit from one sphere

to another) or well-greased door hinges is one of the main contributions to the harmonious combination and smooth operation of the two major social systems of education and work.

The mixed team of experts who will have to work out the organization charts for these delicate mechanisms will also have to take into account the in-built periodicity of the system. The cycles are so old that they could be maintained as a point of reference. Today they comprise thirteen years (called K through 12): five for basic education and eight for middle and secondary school, sometimes called *gymnasium or lyceum* (four years).

Adaptive mode

In contrast to a selective mode, an adaptive mode of education assumes that the educational environment can support many and varied instructional methods and opportunities for success. Alternate means of learning are adaptive to, and are in some way matched to, knowledge about each individual—his background, talents, and interests, and the nature of his past performance. An individual's styles and abilities are assessed either upon entrance or during the course of learning, and certain educational paths are elected or assigned. Further information is obtained about the learner as learning proceeds, and this, in turn, is related to subsequent alternate learning opportunities. The continual interaction between performance and the subsequent nature of the educational setting is the defining characteristics of an adaptive mode. The success of this adaptive interaction is determined by the extent to which the student experiences a match between his specific abilities and interests and the activities in which he engages. The effect of any election of, or assignment to, an instructional path is evaluated by the changes it brings about in the student's potential for future learning and goal attainment. Measures of individual differences in an adaptive educational mode are valid only to the extent that they help to define alternate paths that result in optimizing immediate learning, as well as long-term success (Robert Glaser, "Future Adaptive Environments for Learning", 1996).

Two possible corrections can be made to the prevailing system. One suggests the introduction of credits at the age of 14, two years before the first possible exit into the active world of work. Between ages 6 and 14, the system should develop what, today, we call general and compulsory education. Some countries even devote ten years to that stage, but eight years seem to be sufficient. The two years between the basic level and high school are the time for opting for immediate employment or for choosing a profession that presupposes longer training. This transfer also takes place in the two final years of high school. In certain countries (*e.g.*, France), those years prepare the passage to tertiary education. In fact, they are more or less like college rather than high school.

All variants are indicative of the primacy of the individual pace, a factor that has been neglected in the traditionally rigid system. Should someone wish to collect his or her 320 credits due between the ages of 16 and 24 one or two years sooner or later on, the choice would be possible. It would be equally irrelevant whether one is awarded one's college

graduation diploma at 24 or at 54. The final title is, however, too deeply rooted for it to be eliminated.

In Latin America, graduation from a university gives one the right to call oneself *licenciado*, a title that is inscribed on one's calling card, on one's door, and on one's letterhead. Such titles or diplomas are not compatible with the suggested new system. Instead, Education and Work training certificates obtained at an early age might prove to be more useful in relation to later switches on the helix of work.

Here we have to take a radical, but not impossible, step. Why should the credit system not apply to the field of work as well, thus introducing W credits? Nowadays, it is still the length of service that matters most for a promotion. Since one's active period also includes one's Learning and Work achievements within a lifelong education system, it would be more logical to express experience by means of Work (W) credits plus Learning and Work (LW) credits. One year of work experience would count as nearly 40 W credits. For the duration of an active life, one would acquire at least 1,600 W credits. The system of promotions and corresponding wages could be very much simplified. Special merits and high performance that today entitle one to a bonus or other rewards could account for extra credits.

What will the life of our friend John, who starts as a fisherman, and eventually becomes the president of a foundation, look like? A simple calculation shows that since the age of 14 he has accumulated: 80 LW credits, 80 W credits, 120 LW credits and 120 W credits, then again, 80 LW credits, followed by 160 W credits and 80 LW credits, plus 200 W credits, and again, 80 LW credits. Beginning at the age of 40, his itinerary earns him 40 LW credits and 200 W credits, followed by another 200 W credits after the switch. After 40 LW credits, another 200 W credits follow. Another switch yields 80 W credits and 40 LW credits. After age 65, there are 80 W, 40 W, and 200 W credits. Now he has entered the period of academic tourism with a total of 560 LW credits and 1,320 W credits, let alone the numerous incursions into the general modules of philosophy, political science, and aesthetics. More interesting than the credits collected are the twelve switches that have offered John a diverse panorama of life and knowledge.

The system of credits brings essential changes to the definition of the indicators used to evaluate and study the evolution of different systems according to country or level. When examining the indicators suggested by relevant international organizations, such as UNESCO (global), the European Union (regional), and OECD (group of industrialized countries), one realizes the enormous amount of work that went into this endeavour, without which statistics and quantitative studies would be inoperable. Of course, the simple count of those who study at different levels as well as those who assist them (the teachers) is mandatory for any operational schema. The classification according to sex and age or to entry and exit from a single system is also necessary. We thus obtain the most widely used indicators for performance, management, examinations, budgets, planning, funding, access, research, employment, and equal opportunity.

Unfortunately, lifelong education is mentioned only once in the survey on Society and Work, with a small and irrelevant number of issues. For the "innovative schemes of

collaboration between higher education and the world of work on a humanitarian basis”, states “are likely to undertake a survey”. But the recommendations are reduced to a mere enumeration of the formulae involving academics and business people, with a comment on the income that might result.

The most widely used measures lose their relevance in light of the modular schema, lifelong education, and personal itineraries. It is not important how many young people pass from one level to another or how many interrupt the cycle, since this becomes an asset rather than a liability arising from the mobility of the system. Age is also irrelevant, for both young and old people are equally entitled to stay within the mainstream. So are the costs that are calculated only in relation to the budget.

In exchange, a new measure is proposed for the knowledge contained within the system, quantifiable by means of E, LW, and W credits. The LW indicator is conclusive for the effort to gain active knowledge, education for its general formative merits and access to culture, and work for the amount of work-related skills in the mobile and flexible framework of the new schema. The switches from one helix to another measure the mobility within a given society, and they also point to the pursuit of satisfaction and self-fulfillment undertaken by individuals.

5.6. The Network of Experimental Points

Most statements on structural change stop, after a formulation of the best and most noble ideas, at the point of implementation. The nostalgia for action and innovation is mirrored in the frequent use of such terms as new, innovation, adaptation, anticipation, the requirements of reality, and the ideal desiderata. Although novelty appears like a pie growing in a greenhouse, it does not move rapidly enough, nor is it widely known.

The following are some topical issues for the coming years: the emergence of a new kind enterprise, the magnitude of which is given by the new map of knowledge and by the numerous combinable modules according to individual choices, learning spanning over the entire duration of life, the introduction of new technologies, continuous updating of information, and the joining together of learning and work. From the very start, we tend to favour horizontal experiments as opposed to the hierarchical fiat of the hierarchical systems. A pedagogical experiment takes a generation in order to be productive or assessable. Thirty-three years of waiting, *i.e.*, three generations per century, means too much waiting. The pace of knowledge and of economic and social change may reduce the interval to twenty-five years.

The process can begin with the development of current experiments (ten years), followed by changing the funding of macro-systems (legislation, organization, funding) over another decade, and assembling the results in a coherent and operational schema of global scope (another five years). The intervals suggested for the implementation of the Learning and Work schema are not much longer than, say, those required for building a factory or designing the master plan for a city (5 years), nor are they fanciful.

There are no real conceptual difficulties in accomplishing the tasks of the first phase, considering the fact that further action will rely on current experiments. Emphasis is to be

laid on their extension, maturation, acknowledgment, and confrontation. The key word is *network*, rather than a central authority, a global Areopagus, or a flow of vertical top-down instructions. The network is a question of experimental spots.

An outline of its topics emerges from the inventory of current experiments. Here is a tentative list:

- gradual introduction of modularization, especially in the years preceding a predictable exit (vocational and at the ages of 14-16, 16-18; a college exit almost everywhere in higher, postgraduate, adult, and recurrent education);
- opening of all elementary, secondary, and higher schools to persons returning to resume interrupted studies at various ages; adaptation of all methods of evaluation and teaching so as to fit the requirements of lifelong learning;
- multiplication of forms and assimilation of training for work within the general system by means of modules that are equally valuable for the rest of the system (LW);
- more free-choice or optional courses, which will be treated as equal to those required by either the compulsory system or by the demands of the chosen itinerary;
- cultivation of the ability to choose through adequate courses describing various activities and professions; encouraging interest in the development of vocations and aptitudes;
- steps towards the recognition of the forms of learning to be taken from the work sphere into the educational system and followed by their assimilation within lifelong learning;
- retraining the trainers in order for them to move on from master courses to individual or small group tutoring; as teachers are recruited from the general university system, special modular programmes should be introduced for those choosing that profession (for instance, foreign language modules designed to meet distinct needs for translators, researchers, specialists in comparative literature, etc.);
- a new approach to non-formal and informal education, with important resources for specific interests and attractiveness; also, because such courses have many elements that could be included in modules;
- strengthening the basis for source references (well-equipped libraries, data bases) and practical activity (laboratories, workshops, computerized classrooms, etc.);
- intensive use of computers to make modules more attractive and orientational through the use of multimedia techniques;
- development of distance education;
- encouragement of new forms of part-time work and learning;
- establishment of joint councils (involving parents, communities, and the private sector) to provide assistance in the management of educational institutions;

- creation of a favourable atmosphere for innovation through the mass media, special awareness sessions, and meetings (for example, alumni associations);
- enactment of new educational laws and regulations designed to cut red tape and bureaucracy;
- assurance of system maintenance by means of regular bulletins and constantly updated Websites on the Internet;
- support for various professional associations, NGOs, CSOs (civil society organizations), foundations, and private funds that display a particular interest in education and work;
- introduction of specific methods to stimulate participation and anticipation at all levels and to enhance the ability of learners to concentrate, which is currently at risk owing to the informational boom.

We have focused on a particular interval in a person's life that is closest to the concerns of the Learning and Work relationship.

But the formative period of an individual begins much earlier, starting in kindergarten, nursery school, or even earlier. It would be unfair to overlook the interesting experiences in this domain. So would it also be to underestimate the endeavours to capitalize on the acquisitions resulting from advanced knowledge of cerebral functions or other psychological studies. Children display early on a fantastic ability to learn foreign languages (something that has fascinated Noam Chomsky), or to follow the logical steps in assimilating concepts such as space, time, measurement (something that inspired Jean Piaget). Important artificial intelligence centers, such as that at the Massachusetts Institute of Technology, led by Patrick Winston, have created kindergartens in order to study the mechanisms underlying the recognition of formulae. Optional courses have crossed the threshold of elementary education. This huge learning potential that we read in children's eyes, in their clever hands and creative talents, goes down in a descending curve once they enter the rigid and cold environment of formal education. The very fact that such an involution actually happens should be a cause for concern and a perpetual source of inspiration.

The progress of other large systems (the field of work, managerial innovations, entrepreneurial culture, R&D organization) may give rise to new developments of utmost significance for the double helix. It would make a great deal of sense to establish an early partnership with those who are interested in the classification of the sciences and in the global mapping of knowledge. These projects need time to mature and, no matter what happens in the experimental phase, the crop will be reaped later. It will also take at least ten years, and it will depend on the measures that the major decision-makers might choose to enforce at the level of macro-systems. While the classical institutions may have been favoured in this experimental phase, it is also clear that such innovations as the open and corporate universities, spurred on precisely by the inadequacies and narrow-mindedness of those institutions, are likely to lead to further interesting experiments inviting broader generalization.

If we have considered experience and its horizontal movement over the same ten years, it does not mean that measures toward more opening and reform cannot also be initiated from top down by central authorities. That is what the Japanese system is currently undertaking.

Here are some of the more plausible and feasible measures:

- Development of a unitary system, based on the modularization of knowledge, individual itinerary, and lifelong learning by means of adequate legislation allowing for frequent switches between learning and work, with adequate funding provisions from public and private sources.
- Encouraging existing governmental organizations and creating new ones to work together in support of the double helix of education and work with the business community and civil society (trade unions included).
- Complete harmonization of education in the sphere of work with work in the sphere of education to be reflected in correlated evaluations and recurrent, interchangeable, activities.
- Large scale introduction of the tutorial system based on individual guidance, which does not imply abandoning classical specializations (those of mathematician, biologist, social scientist, and humanist). On the contrary, the best sources for the modules on sciences are the specialists themselves, and they will also write the modules. The novelty lies in the time gained for scientific research, with universities and also the secondary schools as reliable pillars.
- The implementation of the Learning and Work concept will trigger great changes in the institutional structures of states.
- The most important innovation will be reform of the funding system for the two social systems of learning and work by means of a common methodology and a single chapter in the state budget taking care of both of them.
- The major educational questions (interdisciplinarity, lifelong education, the combining of social demand with individual fulfillment) are likely to find answers that will turn around the obsessive present agenda to accommodate the changes occurring in the field of labour (employment mobility).
- International organizations will become more active in supervising regional and global generalizations of mature solutions.
- Statistics will be simpler once credits become the measure of one's knowledge through social mobility and the number of switches on the double helix.

The historical trajectory also matters. If the Twenty-First Century continues to be haunted by identity crises and social or ethnic conflicts, if certain inner cities become battle grounds for urban warfare, if peace does not prevail, a rational effort toward radical change through Learning and Work will not be able to flourish and come to fruition.

If, however, conflicts are successfully prevented or peacefully resolved, this schema will be established within a favourable environment. More than that, the co-operation it invites, involving political decision-makers, executive authorities, and the material power of knowledge and money will eventually affect the substance and methods of local and global governance. No soil is more propitious for nurturing new methods of societal management in the era of knowledge.

The individual will benefit most from the effects of the macro-measures to be experienced in the next three decades. His or her dignity will rise as a result of the recognition of his or her statute and role. He or she will make choices that have traditionally been reserved to others. Briefly, he or she will become, more than ever before, the master of his or her own destiny, broadly mirrored in his or her Learning and Work trajectory, bearing the specificity of a personalized fingerprint. It is to be expected that cohesion and partnership, rather than contest and competition, will govern these parallel games. The United Nations will be entitled to say that an important correction has been made to alleviate the drawbacks of globalization. It may sound a bit like *tempo di marchia*, but the Twenty-First Century deserves it.

Author Contact Information

Orio Giarini - Email: giarini.orio@gmail.com

Mircea Malitza - Email: m_malita@upcmail.ro