Challenges & Options: specific proposals

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Compiler

UNESCO

Caracas, October 1992

New Technological Model and Higher Education: A View from the Changing World of Work

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Introduction

Universities in developing countries are called upon to perform many and complex functions simultaneously. Yet, at certain periods and under certain circumstances some of these functions stand out as a pre-condition in order to be able to carry out all the others. Thus, in times of colonial oppression universities are expected to serve as havens for national and cultural identity; in times of dictatorship defending freedom of thought takes on the key role; during the initial drive to industrialize, turning out an increasing number of professionals within the population becomes vital for social mobility and for providing the human resources capable of managing the growth process. The present period requires an extraordinary effort of self-transformation on the part of universities. Most developing countries are engaging in a complex restructuring process of their economies and institutions which demands the intensive preparation, reeducation and continued updating of high level human resources.

In fact, one of the greatest challenges currently faced by institutions of higher learning in Latin America is responding to the requirements of new technologies. The technical and organizational model that led us to the level of industrialization we have attained and which shaped the type of firm we have today is quite different from the one we now need to adopt and develop.
The productive system worldwide is undergoing a change of paradigm; a transition from mass production, which is energy and raw material intensive to flexible and adaptable production, which is information and "knowledge" intensive; from a production organization whose goal was optimized routines to another whose main "routine" is constant technical change.

This transformation is closely linked to the diffusion of information technologies based on the use of increasingly powerful and low-cost microelectronics.

The universality of its applications—through computers, telecommunications, digital control systems that can be incorporated into production equipment and final products—affects one productive process after another and raises the technological intensity and information content of the different activities and of the goods and services themselves. This all-pervasiveness is accompanied by a tremendous capacity, given the necessary organizational change, to improve performance, effectiveness, flexibility and quality of any productive activity. That is why microelectronics has become the core of a vast and profound technological revolution.

So we are in the midst of building, disseminating and generalizing a new paradigm in the ways of producing and organizing. This transition implies the obvious danger of falling even further behind, but it also constitutes an opportunity. As the continuity of technology is partially interrupted new possibilities for catching up in development are opened up. Seizing this window of opportunity is not easy, but it is possible. The probability of doing so is greater for those who understand the new set of technical and organizational principles and take a creative stance on adopting them. It is also greater for those countries whose institutions are flexible enough to pave the way for taking advantage of the new potential using their past achievements in development as a starting platform.

1. Elsewhere, we have provided the basis for this statement and argued that the great waves of technological change that take place approximately every half century imply profound changes in the socio-institutional framework on a national and worldwide scale. We have also suggested that these periods of transition offer the best opportunity for lagging countries to catch-up in development. See, for example, Pérez, C., "Microelectronics, Long Waves and World Structural Change: New Perspectives for Developing Countries," World Development, Vol. 13, No. 3, pp. 441-463, 1985 and Freeman, C. and Pérez, C., "Structural Crises of Adjustment, Business Cycles and Investment Behaviour" in Dosi, G. et al. eds., Technical Change and Economic Theory, Pinter Publishers, London and New York, 1988, pp. 38-66. A similar interpretation with a somewhat different perspective is presented by the French "Regulation" school represented by Aglietta, Boyer, Coriat, etc. See, for example, Boyer, R., "Technical Change and the Theory of Regulation," pp 67-94 in Dosi, G. et al. (mentioned above) and the most recent work of Coriat, B., Pensée à l'avenir, Christian Bourgeois Editeur, Paris, 1991.


3. This is one of the main conclusions reached by the MIT's Commission for Industrial Productivity, whose purpose was to identify the causes of the decline of competitiveness of U.S. industry, particularly as compared to the Japanese. See Dertouzos et al., Made in America, The MIT Press, Cambridge, Massachusetts and London, 1989. A similar message is being given by the top business consultants to businessmen and managers. See, for example, Peters, T., Thriving on Chaos: Handbook for a Management Revolution, Pan Books, London, 1989 and the arguments presented by Crozier in L'entreprise à l'écoule. Apprendre le management postindustriel, Editions, Paris, 1989.
Production System Requirements as a Source of Criteria for Change in Education

The way to improve the quality of education has always been intensely controversial among educational specialists. Today, the world of economics and production has become an active participant in these debates. This is particularly so now because of the decisive role played by knowledge and human resources in the new techno-economic paradigm. Yet, it is typical of times of technological transitions to see the productive world take an active interest in the direction taken by the educational system. The generalization of mass education accompanied the diffusion of the mass production paradigm, and the development of higher technical education (the "Technische Hochschulen" in Germany at the end of the past century, for instance) happened in parallel with the rise of the science-based electrical and chemical industries.

Hence, in times of technological transition, analyzing the nature of the changes confronting firms can become a rich source of information about some of the new needs to be fulfilled by the educational system.

This paper hopes to make a useful contribution in this context. Starting with the main changes that take place in companies that are modernizing, we will try to extract the implications as to the type of training required. We will limit ourselves to the university level since this work is presented within the framework of a book on higher education. We should, nonetheless, emphasize that the transformation required involves all levels and the entire spectrum of education and training.

A Common Ground for Collective Innovation

As the title indicates our point of departure will be the firm and its requirements. But it must be stressed that this does not mean the present perceived needs of Latin American firms. We shall start by analyzing the new technological model in countries and companies with state-of-the-art status in order to identify the trends generated as such changes spread across industries and countries. This allows us to anticipate what Latin American companies will be like as they modernize and from there to explore their educational requirements. So, we are doing a form of forecasting on the one hand and on the other venturing into the field of education specialists. By identifying the characteristics of technical and managerial change at the world frontier we are delineating the pattern of transformation our own production system is likely to follow sooner or later, with greater or lesser success if firms expect to survive international competition.

Our incursion into the educational terrain takes us into the field of other specialists. Our ideas is this area based on the likely future needs of Latin American firms and are intended more as suggestive than systematic or conclusive. They are aimed more at stirring up concern than at being normative. Their main purpose is to invite those who deal with the theory and practice of education to seek together a better understanding of the changes that are taking place around us, in order to plot, along with the many other interested sectors, a path for the transformation of the educational world that will render it efficient and relevant in raising the potential of our countries for development.

The route we will take is to describe the changes that occur in companies and the effects of these changes on the professional profile which is required. Since many readers are probably not familiar with the internal working of firms, we think it justified to cover as much ground as possible at the expense of in-depth examination. We have also exaggerated the break between the new and the old models by presenting in both cases a simplified stylized, version rarely occurring in reality. The aim is to establish as much common ground, as possible within the confines of a brief article, to facilitate communication and to awaken interest.

The first section analyzes the technological dynamism that characterizes a competitive company under the new paradigm and its educational implications. The second describes the new trends that transform a company at an organizational level and their effect on the methods of training career professionals. Finally, the third section examines those aspects that we believe condition the approach to the actual process of transformation.

Section I

People Accustomed to Continuous Technical Change for a Flexible and Adaptable Organization

One of the features of the paradigm with the greatest transformative impact on company operations is the greater speed at which technical change occurs. It is not so much a question of an increase in the rhythm at which new technological knowledge is generated, although this happens in some areas. It is primarily a matter of accelerating the rate of introduction of change. This is based on the increasing ease of data processing afforded by microelectronics technology and is reinforced by the development of a series of organizational techniques to take advantage of that potential.


5. As a result of extensive practice in supporting the introduction of computerized systems in industry, Ingersoll-Rand, a United States firm, has established that organizational change is a precondion for getting the most out of computer equipment. See Ingersoll-Rand (Montana, ed.), Integrated Manufacturing, IFI, Publications Ltd., Berlin, Heidelberg, New York, Tokyo, 1985. See also Bessans, J. and Rush, H., "Integrated Manufacturing," Report to UNIDO, Vienna, December 1987.
From Standardization and Optimization to Adaptability and Continuous Improvement

The current transition involves a significant change for firms. The traditional mode of mass production worked towards optimized products and processes and toward the ideal scale which would bring unit costs to a minimum. The organization of production implied an effort to standardize products and processes and, at the same time, optimize manufacturing methods, work distribution, and job responsibilities to be carried out by each person in a specific position. Technological change was costly and, therefore, its introduction was carefully planned by experts.

By contrast, a modern company, meaning one that becomes competitive by adopting the new paradigm, is a "earning machine," a structure designed to encourage change, a flexible and adaptable organization meant to operate in highly segmented and changing markets.

Prompt Response to Changing Needs

Given the potential for flexibility offered by new technology, world markets for each product are characterized more and more by separation into many segments, big and small, and in specialized niches by type of user. But, in addition, each segment and the whole are subjected to a rapid pace of technical change. This forces each company to make strategic decisions on the market segments it wants to target for business. The decision tends to be based on what the company considers its core competences, since the only way to maintain and strengthen a position in dynamic markets is through solid specialization based on consistent and continuous technological effort. Each company should strive to strengthen its ability to adapt to modifications required by users or induced by competitors, as well as consider the possibility of initiating its own innovative changes.

Besides technological changes, companies should also be in a position to respond rapidly to demand variations in terms of volume, quality, and product profile. The new optimal practice model sees large static inventories as a waste of money that burdens costs and reduces competitiveness. This calls for an organization that is capable of acquiring and rapidly processing technical and market information in order to flexibly respond to changing demand patterns.


Information Technology and Continuous Improvement

All of these new ways of operating are completely coherent with the potential inherent in computer and communication technologies that handle, process and transmit data. As mentioned above, it is precisely this group of technologies built around microelectronic applications that supports the trend to turn change into the normal operating procedure.

Let us take as an example the practice of incremental just described. Diagram No. 1 shows that information technology provides a wide range of technical tools to achieve the desired objectives. We are aware that many of the concepts mentioned in the diagram may be unfamiliar to many readers. It is not, however, necessary to go into technical detail because doing so would deviate from our main goal. The diagram is only intended to illustrate the abundance and variety of new tools available for the typical goals of the new management model.

This convenient match between new organization and new equipment permits advances in productivity, flexibility, reliability and other competitive elements to multiply and intensify over time. This consistency reinforces the probability of generalized diffusion of the new technological model.

Recognition of Personnel as Human Capital

Despite the abundance of new computer equipment, human resources are being recognized as the determining factor. In order to sustain a dynamic organization like the one described (given the many variants that naturally characterize the different specific circumstances), one must have personnel capable of assimilating, handling and generating a consistent rhythm of technical change. Since such personnel becomes the source of the company's competitiveness it is no longer seen as a cost to be minimized, but rather as an asset — capital — to be increased. Training in several skills, continuing education, compensation based on capabilities, and a tendency to offer complete job security to those employees whose knowledge is most closely linked to the company’s area of specialization are all characteristic practices of the new technological and organizational model.

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12. Deroules, op. cit., Ref. No. 2. See also commentary by Matsushita, K., in Sciences et techniques, Special Issue, 1989, p. 11.

Need for Qualified Professionals to Take On and Carry Out Technical Change

An organization like the one described could not function with routine and passive personnel. The educational system charged with teaching those who will become part of the modern production world cannot, therefore, be content with just transmitting state-of-the-art knowledge of some particular discipline at a given point in time. It must prepare professionals who are capable of taking on technical change as a daily routine all along their careers.

This suggests that at least three important skills must be developed in career professionals: capacity for assimilating new information, ability to be innovative and habits of keeping up-to-date, including the conditions that make the latter possible. (See summary in Diagram No. 2.)

Potential for Acquiring New Information

Providing a career professional with the ability to assimilate new knowledge will probably imply putting emphasis on a solid and basic general background rather than on a very defined and narrow specialization. Preparation as a generalist allows movement from one area of specialization to another when conditions so require and also permits the assimilation of changes occurring within the special area chosen, even if they diverge substantially from the direction originally taken.

University professionals must also be trained in keeping up with the latest advances, at the frontier of science and in the applications related to their field. It is also important to teach them how to find information using a variety of technical tools, be they traditional or computerized, and to process it with various methods and for different purposes.

Because of the speed required to gather information, it is impossible to limit oneself to that which is available in Spanish. This means that in Latin America it will be essential for every career professional to have a working knowledge of languages. We wish to stress this point because we know it could cause serious controversy due to the issue of cultural identity. Yet, small isolated European countries like Sweden, Denmark, the Netherlands, etc., have made it possible for large segments of the population to speak two or three languages while retaining their culture their idiosyncrasies and their national identities. This is vital in a world with open boundaries like the one to come. The speed of access to information determines the potential for competitiveness. Not knowing the languages in which such information is predominantly available can become an unsurmountable disadvantage. The problem is not how to isolate oneself to protect cultural identity but how to multiply and enrich ties with the outside world and at the same time revitalize and strengthen one's own culture.
Ability to Be Innovative

A second skill to develop in today's university professional is how to be innovative and introduce changes. First, this suggests rejecting any method of teaching that prompts routine attitudes and giving preference to the development of creativity. In addition, teaching good research habits as a means of understanding reality at all levels becomes necessary. This does not mean only formal laboratory research, though that is also necessary. It is a question of getting students accustomed to adopting an inquisitive attitude from the outset as part of their normal daily activities. Although only a small portion of career professionals will engage in generating scientific knowledge, the great majority will share incremental improvement as a characteristic of their daily practice.

The investigative attitude required is associated with another important aspect of preparing for technical change: the practice of identifying problems and seeking solutions openly and creatively. Without suggesting that the solution of single-answer problems as a method of teaching be dropped, it seems necessary to train students to handle problems with many possible answers and real problems that entail evaluating alternatives and, at times, coming up with original solutions.

Conditions for Keeping Up-to-date

The third condition to assure is the possibility of regularly updating knowledge. This possibility depends on the characteristics of the trained professional and on the behaviour of the institutions themselves. Professionals will be capable of updating themselves if they have acquired autonomous study habits; if since their student days they have gotten used to keeping up-to-date through specialized literature and have become disciplined enough to study independently.

These attitudes are reinforced if educational institutions are able to establish the constant renewal of their study programmes as a norm. One way to enhance this capacity for renewal is eliminating any administrative rules that restrict teaching contents or exclude people or sources of up-to-date information and experience. Institutional creativity must be developed to strike the right balance between the encouragement of initiative and openness, on the one hand, and very demanding and dynamic systems for evaluating results, on the other.

Finally, to help update working professionals on a continuous basis, it would be desirable to offer lifelong education at teaching institutions and provide ample access to it. The idea that every university course must be part of a program that leads to a degree does not seem adequate for today’s requirements. Allowing people who need to enrich their professional practice to attend “regular” courses brings a refreshing combination of practical knowledge and experience to the classroom which is rewarding for both teachers and learners. Last, but not least, having people from the working world attending universities as teachers, students or simple listeners can be one of the most potent antidotes against stagnation and loss of relevance.

Most of the preceding requirements sound very familiar to experts in the field of education. For decades avant-garde thinkers in the teaching world have been crying out for changes of this nature. What is more, after many a fruitless attempt, some may have already fallen prey to scepticism and will tend to view our proposals here as utopian or even outmoded. This is ironic and in a sense is also a pity. At present the circumstances of that debate are radically altered. Those ideals of total human development have a greater probability of being successfully pursued in practice because they are increasingly consistent with the concrete requirements of the economic agents. In the old world of discipline and rigid routine, creativity and the ability to incorporate change were regarded as having a subversive effect on the company’s organization instead of being functional to its purposes. One can easily imagine that when the idea of mass education at the university level was first proposed it must have seemed just as utopian.

Section 2

People Capable of Creative Group Work
for an Interactive Network Structure

Getting back to production, let us now turn to the transformation that takes place within the very structure of the company. The transition to the new paradigm affects power relations within the organization, leading to decentralized structures with widespread delegation of responsibilities. In order to operate in changing markets with products that are constantly being improved, firms must do away with departmentalized organizational schemes, where those who think and plan are separated from those who do the work. To be competitive, a modern business must be agile and built upon the responsibility and initiative all of its members.

From Rigid Pyramids to Participatory Networks in Open System

The challenge posed by the transition in terms of technology is accompanied by an equally great challenge in terms of organization. The trend is to leave behind the compartmentalized hierarchical organization and head towards a horizontal type of management structure in the form of a network based on semi-autonomous integrated units.

Limitations of the Former Hierarchical Organization

The traditional structure, which was so efficient at first, later took its basic characteristics so far that it ended up revealing its intrinsic limitations and becoming counter-productive. Excess centralization of decision-making power turned the highest position in each company into a level faced with permanent crises and the responsibility of solving all problems, big and small, internal and external, long-term and short-term. This made it impossible for the analysis of strategic direction, the definition of main policy guidelines and the evaluation of the company's potential for development to occupy their rightful place in the thinking and activity of upper management.
Equally the formerly effective division of tasks into specialized departments by function — purchasing, marketing, planning, production, quality control, maintenance, research and development, etc. — resulted in loss of the total picture and dilution of responsibilities for final results. Savings in purchasing might lead to quality control problems and market loss, but the method of evaluating partial results made it impossible to determine the original cause of the problem and, what is worse, could lead to mistaken praise and blame. Moreover, each department set up barriers blocking communication with the others, thereby hindering any contribution to the task as a whole through exchange of ideas. The traditional confrontation between production and quality control, for instance, discouraged efforts to improve the production process. Distance and mutual rejection between the research and development and the production departments often led to an unconscious sabotage of innovation efforts.

Finally, since a characteristic of a pyramidal structure is that any extension of its base implies an increase in middle levels, company growth resulted in increased bureaucratization. This led to slower and more cumbersome responses to the proliferation of reports and meetings instead of action, as well as a cleavage between those who were in touch with the reality of production and markets and those in charge of making decisions. All in all, the hierarchical departmentalized organization became rigid and lost sight of its objectives.

Many readers will already have detected much similarity between these organizational problems of firms and those that occur in hospitals and universities, ministries and government offices, banks and international organizations. In fact, the crisis of the organizational model is generalized and is part of the gradual exhaustion of the old technological model. The ways to overcome this crisis in companies, are adaptable to all types of institutions as solutions to the same lack of flexibility and subsequent loss of effectiveness and creativity.

A Network of Semi-autonomous Units

Modern organization strives to overcome the limitations of the great hierarchical pyramids by bringing down most of the horizontal and vertical barriers that impeded dynamic interaction and by rebuilding the organization around its rediscovered purposes.

The first need is a drastic reduction of supervisory levels. The role of intermediary and transmitter of orders and information performed by middle management is reassigned to computers and communication networks. The trend is to turn managers into leaders of semi-autonomous integral, interfunc-
Internal Technical Interaction

In this context, for instance, all the technical skills of the quality control and maintenance departments, that were used to supervise, control and perform routine duties can be redirected towards generating innovations or executing more demanding technical functions. As concerns the research and development department, it no longer functions in an isolated manner. The traditional sequential scheme whereby a product or process was developed by the R & D department and later "transferred" to the Production department is being gradually abandoned. It has been found that development through permanent interaction with personnel in production, purchasing, sales, etc. is much more efficient. The results are more realistic, directly usable and responsive to the explicit requirements of users16. This interactive behavior has led to the use of the plant itself as a laboratory with a significant reduction in both the time required for development and for moving up the learning curve17.

Top Management as Leadership

In an interactive and participatory organization like this, top management assumes full responsibility for strategic planning, establishing major policies and specific goals, evaluating results, making key decisions on technological progress and the development of the firm, and relating to the outside world in accordance with their fundamental objectives. In practice, they act more as leaders of a dynamic organization than as authoritarian rulers of a regimented structure.

An Open System of Multiple Cooperation

The closed system model of the firm whose interaction with the outside world took place merely through purchasing and sales transactions is also left behind. Under the new technological model, a company becomes an open system with multiple forms of technical cooperation with suppliers, customers and even competitors. The rate of innovation is such that it is difficult for any company, no matter how big or small, to keep pace with the latest developments in several fields. Each company tries to identify its core competencies in order to center its efforts on those areas in which its potential for competitiveness is greatest18. To complement this, there is a tendency towards setting up limited technical partnerships with other companies, including some that might be strong competitors in other areas; developing close ties with specialized suppliers in product, raw material or service areas and strengthening cooperation with the main clients19. In this world of intense and frequent external interaction, competitors force change, users and their requirements provide a main source of guidance for technological dynamism, and suppliers become key partners in heightening competitiveness.

Proliferation of Independent Consultants

One of the consequences of this model of an open company is that a rather sizable proportion of career professionals tend to work as independent consultants, as members of associations or as partners in service or manufacturing companies rather than as full-time employees. Flexible affiliation, multiple employment, and high-level "free-lancing" have proliferated in developed countries over recent years; they have also begun spreading in certain areas of many Latin American countries. These more autonomous ways of operating, inside or outside companies, demand skills which differ from those required by the highly structured context of the more traditional model.

Links with Educational and Research Institutions

Educational institutions and research centers occupy an important place among those partners or service providers with whom modern business tends to carry out intensive interaction20. This constitutes a breaking away from a long tradition of detachment, particularly in developing countries that implemented policies for import substitution. There was really no room for local technology in that model because its very basis was the acquisition of mature and optimized technologies. Tomorrow's reconverted and competitive companies in those

20. In addition to the expansion of direct employment by individual firms, cooperation with universities through intercompany partnerships is also spreading. This practice is designed to share research and development costs in the precompetitive phase and has spread from Japan to Europe and the United States. Several EEC programs, for instance, entail promoting and financing these multicompany setups and their association with research laboratories (ESPRIT, BRITE, RACE, DAP and others are acronyms for such programs).
same countries will discover what firms have already found out in countries that have pioneered the development of new forms of organization: cooperation with the educational, scientific and technological system is an excellent investment.

**Coherence between New Organization and Computer Equipment**

Everything presented so far as features of a modern organization is deeply rooted in the characteristics of information technology. The new technological model arises from the convergence of both waves of change. It is important to understand this because that congruence explains the inevitability of worldwide propagation of the new ways of organizing, directing, working and competing in world and local markets. Without falling in simple technological determinism, it is quite natural to suppose that a society seeking development will use the most powerful tools available to increase productivity, response time, and quality of product, process and service. Microelectronic technologies today provide these maximum efficiency tools.

But, the traditional organization takes little advantage of such potential because its structures are out of harmony with the nature of the new equipment. The new organization model however is in harmony and, consequently, achieves maximum synergy and displays obvious market superiority. However is in moreover, since the new international context is being shaped by these converging waves of change, the organizational modernization of companies, even without new equipment, brings about significant increases in competitiveness.

**Same principles in many variants**

It is important to note that the operating principles which we have roughly outlined do not imply a unique model. As occurred with principles such as centralization, specialization and departmentalization during the age of mass production, the new criteria for organizational design are being applied in many different ways and adapted to different countries, different activities and different conditions. This organizational model is not confined to large firms either. Aside

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23. The cultural patterns and economic and social conditioning forces of the country which initially develops a new organizational model have a very strong impact on the specific way the original version turns out. Yet once it reveals its productive superiority and once practical examples and information become available, the principles and criteria behind that model become independent of the initial specific form and are open to creativity in terms of application and adaptation to other conditions.
from the many variants in these practices among large corporations and multinational companies, similar models exist for the interconnection of small and medium firms. One of the cases that has attracted most investigation is that of Northern Italy where highly specialized small businesses establish cooperation networks to generate scale economies in financing, international marketing, personnel training, research and development, etc. and, in so doing, collaborate extensively with the educational system and the local government.

Need to Train Autonomous Professionals with Interdisciplinary Work Habits

Becoming part of a decentralized, participatory and interactive model requires professional personnel accustomed to working in teams, playing different roles, communicating with people in other areas of knowledge, interacting well with others, ready to act independently, or as a leader.

These requirements place heavy demands on teaching methods and institutional structures, since the educational system too must transcend the hierarchical model and the isolated compartments.

Without delving too far into the area of teaching specialists, we would like to suggest some of the challenges that the new forms of professional life pose for teaching methods (see summary in Diagram No. 4).

Transdisciplinary Specialization and Integration

First of all, we must face the complexity implied by the double need for transdisciplinarity on the one hand and specialization on the other. The development of common languages to overcome the Babel of disciplines, the design of hybrid careers to cover the fusions in work and in technologies, the inclusion of multidisciplinary projects during training, and the acceptance of specialization centered in the area of application are some of the possible ways to get over the barriers set by mono-disciplinary professions without loss of depth.

It is important to stress that professionals who join interfunctional teams at work can no longer count upon the more knowledgeable members of their own field of expertise who were always available in the functional departments. Each

of them must grow more and more accustomed to assuming the responsibility of being the only one in a particular area of specialization within a multidisciplinary team. Hence the difficulty of combining transdisciplinarity with disciplinarity and generalist with specialist that we must strive to achieve.

Self-discipline and Excellence

The other challenge is equally paradoxical. The hierarchical teacher-student model must be surpassed while simultaneously raising the requirement levels. This means finding ways to develop self-discipline and stimulate autonomy while the manner of evaluating performance becomes more demanding and strict. It would also seem necessary to encourage teamwork for various purposes, accompanying it with effective ways of collectively estimating levels of participation, contribution and results.

Interaction with the Outside World

Finally, we must face the new challenge of opening up. Aside from internal, hierarchical and disciplinary barriers, it is vital to bring down the walls that separate universities from the outside world, in order to strengthen not weaken them and make them more relevant and vital. Just as companies reestablish communication with their users and derive technological dynamism from their clients’ demands, institutions of higher learning must also establish close ties with the world of working professionals. It involves opening their doors to career professionals in firms, communities, social or government activities as teachers and students, engaging in many joint projects, big and small, with a double tutorial system — both academic and managerial —, increasing internships, designing an appropriate framework in which professors and researchers can act as consultants, bringing together the interests of all involved and obtaining the maximum teaching benefit from this frequent interaction.

Section 3

The End Justifies the Means or How to Approach the Process of Transformation

The exercise we have just concluded is just a beginning. Many other changes associated with the adoption of the new business paradigm could be analyzed to extract additional insight on teaching professionals. However, the objective was not to perform a thorough study, but rather to show the possibility of using the requirements of the productive system as a guide for innovation in institutions that train human resources. In our opinion, reference to the outside world and acceptance of its participation is one of the most promising ways to find criteria for a socially relevant educational transformation.

The second objective of the previous discussion was to help understand the difficulties involved for the people in charge of reconverting the productive apparatus. Everyone can see that the changes in the hitherto prevalent organizational model constitute a sort of mental earthquake for an entrepreneur or manager. They mean disregarding each and every efficiency rule and each and every way of doing things that apparently worked well in the past but are now inadequate for competition and even for survival. In fact, it becomes a question of dismantling established common sense norms and replacing them with a new productive and organizational logic, a new paradigm. Any support to help bring about the change, therefore, is extremely valuable.

Change in Latin American universities will be no less difficult or profound for those involved, but it could be slower. Universities are not subject to the same strong pressures that result from competition and threaten a company’s survival, forcing it to transform. Nevertheless, society should be able to expect that institutions charged with generating and transmitting knowledge should become aware of the transition, analyze its implications, and find the strength to carry out their own transformation. Otherwise, the educational system will constrain the potential for modernization in our societies. If the change fails to take place now, in five or six years we will still be turning out obsolete professionals.

It does not suffice, however, to become aware of the urgent need for change. It is not even enough to define the precise direction of the required transformation. It is also important to reflect upon the most satisfactory way to implement the modernization process.

Adoption of the New Efficiency Principles

Given the severe handicap implied by the inherited structures, trying to make modifications in traditional ways would guarantee failure. An active, dynamic, flexible and avant-garde university that is constantly renewing itself and training creative and autonomous personnel cannot be designed, planned or transformed from the top and from the center. That way of directing, that way of separating those who think and decide from those who do and act is part of the old Tayloristic model. Those centralized, rigid and bureaucratic structures that characterize many universities and Ministries of Education and Planning in Latin America are in no condition to implement the transformation required without first dealing with their own organizational modernization.

Efficiency and responsiveness resulting from decentralization and multiple delegation of decision-making power have already been amply proven within the business context; and have long been characteristic of the best universities in the world. Great benefits have been derived from the creativity of semi-autonomous universities and the participatory model; dynamism resulting from closer relationships with users has been observed. One would expect an organization whose personnel is, by definition, part of society's elite, to opt for the most effective available way to operate and to delegate the direct responsibility of creating attitudes, contents and structures for the future in each of its members within their individual fields.

Bringing Down the Walls that Isolate the Education System

The mass production paradigm recognized task division, specialization and clear demarcation boundaries as one of its principles of efficiency. The
import substitution policy in Latin America reinforced this tendency and also contributed to isolating the production system from two of its potential sources of dynamism. On the one hand, protective tariffs became a wall isolating businesses from changes taking place in the outside world. On the other, that same protectionism and the fact that mature (taken as optimized) technologies were being bought from abroad isolated firms from local institutions that generated and transmitted technology and knowledge. There was no need for technological efforts to incorporate technical change or creative personnel because profitability was not dependent on the company's level of productivity or the quality of its products, but on exogenous factors linked to State-controlled decisions regarding subsidies, captive markets, forms of protection, prices, etc.

Successful realization of the productive transformation and the achievement of structurally competitive countries calls for destruction of these barriers. Development under the new paradigm thrives on interaction and is built up by unveiling and resolving false dichotomies and paradoxes which we inherited from the recent past.

As the new paradigm spreads, companies that are able to implement it successfully discover in practice that cooperating with the educational system is not an expense, not a donation, but rather a high-yielding investment.\(^{25}\)

The importance of human resources for modern business forces it to develop a strategy in this respect. Two trends, can be identified which in the long run can be complementary or divergent depending on the surrounding circumstances. One of them is that which brings the university to the company. Many high-level postgraduate studies in Japan, Korea and other countries are set up by inviting top professors to come from wherever they are to train groups of professionals within the most powerful companies. The other trend is that which leads a company to collaborate with a university as part of a mutually beneficial strategy. The latter is the sort of evolution being favored by very prestigious universities in the United States, England, and other countries. One could expect this second route to be broader and more beneficial within the social context of Latin America.

Under these new conditions, it would no longer be a question of building the desirable and illusory "bridge" between university and industry, but of establishing ample space for mutual cooperation and influence, developing scenarios for effective collaboration, and creating conditions of respect and trust for a joint definition of strategies. The goals of business and universities are certainly not identical and mutual interest depends on each partner respecting these differences.

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25. An account of how a U.S. company went from spending $7 million a year on in-house training to almost $5 million a month on cooperation with all levels of the educational system can be found in Wiggenhorn, W., "Motorola U: When Training Becomes an Education," *Harvard Business Review*, Vol. 68, No. 4, July-August 1990.