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Science and Higher Education in the Process of Internationalization. Elements of a Conceptual Framework for Latin America

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1. Globalization and the inequality of nations

Although the world may now be regarded as a single system, there is as yet no world society and conflict and fragmentation are more in evidence than integration and global governance. Wide disparities exist: the rich countries and the poor countries differ in fundamental aspects, since their circumstances vary enormously. Global competition for markets and technological innovation have interacted in such a way as to produce an anarchic world economy, inevitably providing the setting for major geopolitical conflicts. Instead of an increasing number of modern societies which to a greater or lesser extent replicate the model of the prosperous Western society prevailing in Europe and North America, as might have been hoped, there now exist many modern societies that are in fact failed attempts at modernity.

While the most powerful countries continue to play a central role in global politics, others are suffering a serious erosion of their sovereignty. This is of fundamental importance for the process of global development. While some differences may be attributed to the unequal distribution of resources, it is widely acknowledged that the historic growth of inequality between nations is related to other factors. In many parts of the world, the modern State does not exist or has been weakened, as illustrated by the restrictions imposed by the international monetary institutions on national economic policies; the impact of the strategies of transnational corporations on the workers, consumers and business leaders of many of the countries where they operate; and the dynamic of the international mobility of scientists and technologists as a result of the implicit or explicit policies of the most industrialized countries, which further weaken the already lagging capacities of the poor countries.

Furthermore, although nation-States still have strong collective identities and basic institutions for decision-making, they share the stage with other important social actors, such as international governmental and non-governmental organizations, international markets, multinational corporations, global collective movements and transnational communities. Reactions to globalization – such as aggressive nationalism, the problems arising from the coexistence of different cultures in increasingly multi-ethnic societies, cultural insularity, religious intolerance and prejudices of various kinds – further erode the authority of the nation-State.

The crisis of values in the contemporary world means that the wave of inventions driving the global economy is increasingly difficult to control. The technologies that lie at the heart of current global economic forces condition us in ways that we cannot even begin to understand. The institutions which might monitor or counteract their side effects do not exist or are very weak. We are on the brink of a tragic era, when anarchic market forces and the constant pressure on dwindling natural resources will push sovereign States towards increasingly dangerous rivalries. Ever more frequent examples show that “one-size-fits-all” approaches in response to widely differing situations are not necessarily the most appropriate, especially with regard to the needs of the developing countries.

Such approaches, which show little awareness of the particular features of the very different countries that have emerged from the break-up of the colonial world, have been commonplace in the development policies of the last 50 years. It was claimed that the transplanting of scientific and
technological institutions as forces for modernization would in itself be sufficient to achieve modernization and hence social and economic progress. There is obviously an urgent need to redefine the role of science and development policies in countries with no science infrastructure so as not to continue to fall into such traps, while at the same time taking advantage of the potential of science. Meanwhile, science itself has been changing in step with the historical processes taking place in the economic, technological, social, cultural and environmental fields, as have the products of research and the methods employed.

It is not by chance that it is precisely the extreme reductionist analytical approach which is used in research undertaken for purposes of “corporate knowledge”, since this means that the contextual aspects of science, particularly its impact on the human and natural environments, can be regarded as “externalities”, to be dealt with in due course by the regulators and those concerned with the ethical aspects. In contrast, a new awareness of science, which is both systemic and humanistic, which accepts uncertainty and value judgements and involves, extensive communities concerned with its social impact, is beginning to take up the cause of “public knowledge” at a time when the academic sector is being reduced to impotence.

2. Is this the end of the golden age of science as an autonomous discipline?

Throughout the nineteenth century and during the first half of the twentieth, the unity of science and the pre-eminent position it occupied as compared with other forms of knowledge went largely unquestioned. The cognitive dynamic of science, together with its social organization, led to the creation of pure, basic, fundamental, academic science through the establishment of scientific disciplines and of methods for the production, dissemination and legitimation of scientific knowledge that became accepted as the norm. Although applied science, i.e. science that is directed towards solving concrete technical problems, also developed in the nineteenth century as a characteristic form of interaction between scientific development and technology, the growing significance of science and technology in society was seen as the result of the availability of new techniques deriving from the autonomous development of theoretical science rather than from a demand for technology as a means of solving problems. In this way, scientists sought to protect the recently achieved professional autonomy of their disciplines against the demand for science directed towards technical applications.

The scientific disciplines came to provide the basis not only for the classification and codification of knowledge, but also for university structures. As far as education in particular was concerned, this meant that it was organized within the universities in terms of the cognitive structure of the various disciplines. It has been said that the organization of disciplines in this way made higher education more international or “meta-national” than secondary education. It has also been claimed that the scientific discipline generally provides the main focus of individual endeavour, that it brings shared control over the work (between the university department and the academic community of a particular discipline, for example), and that the structure in terms of departments or university chairs has become the basic element of the organizational structure. The fact is that although science always found the best possible home in the university – or in higher education in general – it was an uncomfortable place for it and the coexistence of research with teaching was not always free from tensions and conflicts.

The Second World War saw the beginning of a profound transformation of industrial and military activities in their relationship with the sciences and the state machinery of the industrialized countries. The reorganization of productive processes involved the reorganization of knowledge, in order to ensure that the Cold War would not be lost. This gave a higher profile and greater urgency than ever before to science and contributed to the use of industrial analogies and images for the description and management of scientific activity. Forms of scientific work carried out in previously
unexplored or marginalized contexts acquired new legitimacy and visibility. For over half a century scientific activity took place within a political context dominated by the Cold War. On the one hand, the perceived need to strengthen the bases of national and international knowledge led to the initiation of processes for the interchange, evaluation and integration of knowledge which continued to form part of the policy on knowledge after the end of the Cold War, as is shown by the ways in which the Science Citation Index, the Internet and research on artificial intelligence have developed. On the other hand, the abandonment by the State of its regulatory control over these developments has left them captive to the competing demands of the global market and of special interest groups of varying kinds. The uncertainties that surround the institutional future of the university in most countries arise from this situation.

The day-to-day autonomy granted by the State to researchers as a matter of routine during the Cold War came at a high price, since it acted as a disincentive, if not an outright prohibition in cases of national security, that left researchers unable to have any say in the purposes to which their intellectual work was put. The result has been that there is an increasing stranglehold on opportunities for researchers to air a scientific viewpoint independent of the interests of the potential public (the client) that is not seen as an attempt by the researcher to serve his own professional interests. Even when these few opportunities are still available, scientists and intellectuals in general have become so accustomed to the changes that have occurred that they have become increasingly incapable of following anything other than the “conventional wisdom”.

3. The development of technology

Conditions changed considerably in the course of the hundred years that elapsed between the middle of the nineteenth century and the middle of the twentieth century. As the Industrial Revolution had a greater and greater impact, knowledge began to be increasingly seen as a continuum influenced by two dominant sets of forces: at one extreme, the market forces for goods and services and, at the other, the forces linked to the interests and aims of professional researchers (still operating independently in academic circles) as a result of which the divide between scientific and technological knowledge began to narrow. Those two fundamental forces have been responsible for the growing internationalization of industry and technological research.

Since the Second World War the successful development of domestic and international markets has required constant technological advances. With time market opportunities have become so great, competition so intense and technical resources so complex and expensive that industry has had to make use of other mechanisms, in addition to huge investments in global facilities, in order to operate effectively at the global level. Links with external sources of technology have developed at the international level on the basis of the extensive infrastructure established by the multinationals. The substantial participation in world production and trade that this investment has produced has enabled the multinational corporations to take advantage of opportunities for growth in new markets and of knowledge of the sources of technical change throughout the world, thereby encouraging mobility not only of capital but also of brain-power.

In this process of change science has come to be increasingly seen more as a resource for economic and industrial growth and less as a universal and intrinsically valuable cultural activity. However, that “economic” trend does not stop there. It has profound implications which are only now beginning to be understood by society. Even if changes in the cognitive structure of science do not undermine the internal foundations of science and its practices, the plurality of theories and the intellectual short-termism that have come to be accepted as legitimate features of modern science impose serious internal intellectual restrictions on the rhetorical force with which scientists can present, within the context of social or political debate, a uniform concept of reality that is superior to all the competing concepts. In many ways, the social perception of the greater complexity of
contemporary science weakens the authority of the same images and metaphors that conveyed the ideological and political importance that it used to have in modern society. By their very complexity the relevant factors that confirm or refute scientific propositions are usually inaccessible to the public.

Contemporary philosophical and historical conceptions of scientific knowledge, the approach taken by scientists and scientific practice itself have now revealed a paradoxical situation. The increasingly visible gap between scientific knowledge and common sense, between professional and everyday concepts of evidence and proof, have had the effect of devaluing science as a cultural resource for promoting, within a wider social context, respect for the superiority of its assertions about the world. As, in the final analysis, there is no clear and emphatic distinction between science and other ways of producing knowledge (until recently considered to be “lesser”, “alternative” or simply “different”), the destabilization of science would appear to have led to a kind of reunification of knowledge, which allows us to explore within a more symmetrical and neutral methodological context ways of knowing that were until very recently rejected out of hand. What is involved, in fact, is a declining role for science and for scientists in the rationalization and legitimization of public policies. Science continues to be proclaimed as one of the pillars of the public democratic arena, as a bulwark of rationality, truth and objective knowledge. But on the way not only has it been profoundly transformed, but that same public arena is being drastically redefined.

4. Knowledge “production” and “consumption”

For a long time, science, as a knowledge system, triumphed over other existing systems through its ability to separate fact from fiction, reality from illusion – something which other cultures were thought to be unable to do. In that process, in contrast to magicians, wizards and shamans, for instance, who were held responsible for their supposed or real actions, scientific knowledge producers were not considered to be socially responsible for the knowledge they produced, since their science was perceived to be independent of any “interest” (it was pure knowledge existing in a distinct sphere – the university – and seen as intellectually neutral). It was thus taken for granted that the production of knowledge had nothing to do with the potential “misuse” such discoveries were subject to in other areas of society (principally industry or the armed forces). Scientific practice was protected for over a century from seriously facing up to its inherently uncertain nature and lack of ultimate control over its actual effects. This was essentially achieved by defining the scope of science as that “in which solutions can be found” and ideologically emphasizing the intended purpose over and above “the collateral effects” (which may include unsuitable or undesirable aspects), similar to the way in which the medical profession traditionally protected itself: “the operation was a success, but the patient failed to survive”.

Such ethical immunity was successfully maintained as long as the focus of the experimental basis of science was sufficiently restricted, and the presentation of hypotheses, data collection and the establishment of critical evidence to rebut invalid hypotheses took place on a relatively small scale both in space and time, within the framework of the analytical tradition and in the context of what is referred to as basic, academic, pure science. In such circumstances, research findings are produced and utilized within the isolated and essentially simple context of the research community. However, this epistemic structure is subject to pressure and distortion during industrial development and particularly in the context of scientific policy. In the case of industrial development, the research findings incorporated into the design process will eventually be tested directly by market mechanisms. When scientific advice draws on research, the latter is used directly in a context that is clearly political as regards its preparation, implementation and justification. In the latter case, very different applicability criteria and value judgements come into play. Non-technical aspects come to dominate the decision-making process, in such a way that the “political” nature of the subject is
decidedly less important. Science is publicly invoked to justify policies on account of its general reputation for objectivity and integrity. Nevertheless, in the political process, there will inevitably be attempts to interpret and manage science through the use of criteria that apply to administrative and political activities rather than to traditional scientific research, with the result that it becomes very difficult to avoid the abuse and corruption of science.

The deep uncertainty which has come to dominate scientific and technological policy in many areas is a sign of a marked lack of public confidence in the “expert opinion” of scientists, stemming especially from the awareness of obvious divergences of views – which reveal either insufficient freedom of expression or excessive dependency on administrative or institutional funding, as may be seen in recent international debates on GMOs, “mad cows”, or on the determination of tolerable levels of industrial pollution in specific situations. In general, different categories of scientists – government, academic or commercial – are awarded varying scores of public “mistrust” reflecting the supposed independence of their opinions and the quality of their expert judgements.

Long gone are the days when the State and science operated independently in their respective fields, interacting only occasionally. With the development of techno-science, things can go more and more seriously wrong at every level and the State, which acts simultaneously as promoter, regulator and user, cannot avoid becoming involved with the resulting problems over policy. Nevertheless, there are radical differences between the areas of policy and of research and these differences must be properly understood, even though there may often be a common interest. The changes reflect the cultural climate of contemporary society and are particularly important in the case of research driven by political considerations. An obvious example of this is the production and use of science for sustainable development, in which the concepts of freedom, justice, equity, basic skills and equality govern the access to and the use of the benefits obtainable from ecosystems. Human welfare has many different components, including the material basis for a good life, freedom of choice, health, good social relations and security, which depend on the general situation, which is in turn a reflection of the local geography, culture and environmental circumstances. The pursuit of sustainable development supposes new challenges regarding the ways in which problems are defined, solutions are identified and action taken. What has come to be called “science for sustainability” focuses on the dynamic interactions between the natural environment and society, on the assumption that knowledge of the system is always incomplete and that surprises are inevitable. The system itself is a moving target, which evolves through the impacts of the management and increasing scale of human action on the planet.

The best way of structuring knowledge systems for sustainability is an issue that is open to research, practical experimentation and comparative learning. Several probable characteristics of such systems have been suggested: for example, the extension to knowledge systems for sustainability of earlier findings in the very narrow fields of scientific advice and assessment is more likely to exert influence insofar as the systems themselves and the process by which they are produced are perceived as important and legitimate and also credible by interested and relevant social actors. A satisfactory degree of achievement of the three criteria simultaneously is a key challenge facing the knowledge systems for sustainability. It is apparent that in more than one sense the new approaches show that there is currently much more room for the “economic agent” or “social actor” variable in relation to knowledge production and consumption. In addition to researchers as producers of knowledge, there is also recognition of the existence of consumers, a wide range of users, target groups in various markets, policy beneficiaries, – even as causes of other problems – or the “real” people involved in countless processes of interaction and communication, not to mention those who find themselves on the margins of the global economy, or even totally outside it, but who are demanding to be admitted.
5. The place of networks in the production, communication and dissemination of knowledge

Since the new century began, the concept and reality of constantly expanding and reconfigured networks have captured the collective imagination in a wide range of scenarios. Countless innovation and research networks have been created, and free flows between research and production now link public and private sector institutions in a continuum that is far more complex than anything that came before it. This all seems to suggest the existence of a social organization mechanism for producing and distributing knowledge that is more flexible and better able to meet the many and changing needs of the present day. The widely held notion that knowledge is created and transmitted through “networks” is obviously linked to the inroad made by the information technologies, but its implications are more far reaching. It should not be forgotten that networks emerge so that quite specific objectives can be met. In more than one meaning of the term, they are task-forces, which presuppose the existence of a store of pre-existing knowledge and differentiated institutional dynamics, elements of which enter into the setting-up of typically transitory networks.

This is reflected in the ease with which networks appear and disappear. Against this background some writers argue that it might well be possible to speak of network failures, in the same way that we speak of market failures, where network-based knowledge could ultimately lead to a restriction in the general distribution of the knowledge produced. When academic knowledge used to be produced according to traditional methods, the problem was resolved on the assumption that the new knowledge would be disseminated freely through teaching and publication. In that respect, universities were the institutional repositories of knowledge, which was seen as a “public good”. The networks in which new knowledge is produced, however, might well be restricted by the property rights of corporations and other bodies demanding secrecy, while at the same time there is no institutional memory once the networks disappear, which could well hinder the general flow of information. This problem is aggravated by the growing virtualization of information, the frequent result of which is that information made freely available on the Internet for a time is then taken over by private systems and is no longer visible and accessible.

But there is more involved in the subject of networks. Today’s networks are made possible by the existence of standard-setting systems in science, which have played a leading cultural role since the nineteenth century by producing an “international professional”, as a common model of qualifications mutually recognized across national and cultural frontiers. When scientists “travel”, physically or virtually, in theory they do so simply as scientists and not as Canadians, Japanese or Malays. The basic assumption is that they move in an “epistemologically shared universe” and it is hoped that the “internationally qualified” professional can cope satisfactorily in “internationally standardized” conditions. Thanks to the existence of common standards and the mutual recognition of qualifications, by means of the localization of higher and postgraduate education in the institutions of the most diverse countries, even those countries without a scientific tradition may set the surmounting of national and ethnic cultural barriers as one of their main objectives. Much has been written on the need to develop scientific infrastructure and research capacities in the developing countries. Taken together, the curricula on offer, the procedures for “ensuring quality”, evaluation and accreditation are very important for guiding the present reforms of Latin American universities and have immediate implications for the way they will evolve.

The world is not, however, organized to perfection nor is it homogeneous. The supremacy of Western ways of thinking and working led to an elaborate system of hierarchies in which everybody has his or her place. The characteristics of the markets, the uneven distribution of wealth, the politico-economic criteria for determining knowledge and the prevailing ideology combine to perpetuate a long-established state of affairs, according to which the very development of science as an international social institution requires, from the outset, the existence of a model that takes on
different features, providing the structure for scientific exchanges between the centre and the periphery, the metropolis and the provinces, the heart of the empire and its colonial outposts, economic hubs and underdeveloped fringes, all of which may be expressed in a variety of ways.

More richly textured responses are required for many of the questions raised by the knowledge networks. One of the major challenges currently facing us is how to drastically reduce exclusion and marginalization and increase democratic participation and autonomy worldwide. Since colonial times, techno-science has been associated with the various modernization projects. But even now most of humanity is still living on the sidelines of techno-science and the related networks. Why? Techno-science travels along set paths and channels which manifestly are not the most appropriate, or at least adequate, mechanisms for bringing about a world with less inequality and for satisfying social needs in very different situations. In fact, techno-science has often led in the developing countries to the consolidation of social sectors that have held back or even prevented broader social participation, thereby obstructing democratic modernity. Let us take an example.

In the 1950s and 1960s, the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) paid particular attention to promoting the growth of a middle class of entrepreneurs, engineers and scientists, professionals and university professors, who were perceived as the potential vehicles of the progressive forces of modernity, who would bring about social democracy, political stability and economic development. However, the particular growth of the middle classes in most Latin American countries only led to partial modernization, which instead of bringing about greater progress, held it back by distorting, diverting and even obstructing the forces of modernity. The academic staff in universities and other higher education institutions who make up the formal national systems of knowledge of Latin American countries are either from the middle classes or hold middle-class values. A good many of them, connected to international networks and having accepted cultural values and models from the rich countries, are often disturbed by the social change that can be foreseen because their situation seems insecure and vulnerable. They would like things to improve, but are afraid that the changes would affect them and drive them from their precarious position in society. That explains their vehement rejection of any changes in the status quo. These social groups and the networks with which they are connected cannot therefore be relied upon to trigger the changes needed to build more modern societies with less inequality.

The new ways and means of conducting research and teaching people how to do so emphasize the exploration, understanding and optimization of the arteries and networks through which products, services, knowledge and information circulate. They also highlight the need to study the new ways of working and the specific dynamics to be found in the sites where knowledge and information are loaded and unloaded. Knowledge networks are veritable “social networks” that demonstrate a fluidity in the way in which objects and practices adapt and are reconfigured as they travel along them. But whereas the structural characteristics of a network are quite easy to distinguish, it is often difficult to determine not only the social and cultural but also the political relations generated through it. In this respect, it is at least as important, if not more so, to try to discover how techno-science travels as to try to determine whether it belongs to a given culture. In the process, the distinctions between global and local would be modified and blurred.

6. Changes in the institutional arena of higher education and research

The scope for the expression of intellectual freedoms, which came to characterize universities in the twentieth century, gradually became more and more restricted as time went by, as a result of the increasing use of qualifications as a principle of social stratification. Mass access to universities meant that they were no longer so closely associated with the formation of scientific and professional elites or the dissemination of scientific culture. A growing number of students attend
university for reasons more specifically linked to hopes of a job in a diversified labour market. Interdisciplinarity, with the ever-increasing possibility of the emergence of new disciplines and specialties, was being constantly eroded by the fragmented and vocational nature of academic training.

The problem is compounded by the changing nature of academic staff. While in past decades, it was considered a triumph to be able to devote oneself full time to university life and a research career, most of the current generation of academics will have to spend at least part of their time as lecturers and researchers on hourly contracts, and some will even spend their entire career doing so. Such arrangements offer little incentive for young people to invest in a future career in the academic world and, indeed, few are inclined or feel encouraged to participate in peer assessment, to carry out fundamental research and publish their findings or occupy leading academic positions – activities which cannot be justified in terms of a career advantage in the short term, but which are an essential part of the university ethos.

Today there are at least two currents of thought in the debate concerning the validity of institutions. The first asserts that the familiar institutions which produce and reproduce knowledge are in crisis, whether they are universities, government or corporate laboratories, research institutes, etc. The second recognizes that despite the growing diversification of knowledge-production sites, universities remain at the heart of the system. This is not surprising if the institutions are perceived as “vehicles” for collective understanding which produce specific consequences: the embodiment of set objectives and shared ways of thinking, such as institutional ideologies, roles and functions, providing the source of legitimation of groups in the institutions, and providing the most important source of financial and political resources which help to achieve desired ends. In the Weberian sense, institutions are repositories of collective knowledge and understanding which, when integrated into institutional designs, become the precondition for institutional behaviour.

Universities represent the sites **par excellence** of the hegemony of techno-science. Together with research laboratories and public and private research and development institutes, they were the strategic knowledge institutions of the twentieth century, perceived as “factories” employing a variety of intellectual capital, enjoying a certain degree of autonomy and “social distance” in the pursuit of their “business”: knowledge. This institutional model developed in the more advanced nations has been formally replicated, over and over, throughout the world. The presence of Western-type scientific institutions in the developing world has been widely accepted as an indication of modernity, resulting from a twofold process: first, it served the interests of the developed countries, secondly, it was a result of the attempts made by underdeveloped nations to dominate knowledge, which constituted the promise of modernity.

However, this notion, embodied in many projects for institutions created throughout the modern history of the developing countries, has met with very uneven success and, in general, difficulties of consolidation. It would not appear to be the case that poor countries are going to achieve development by building an institutional environment shaped on the Western model, as was hoped in the past, or even by participating formally, as they have been requested recently, in the new extended system of knowledge production and consumption. Would universities be able to transform themselves into zones for the barter and synthesis of different types of knowledge competing for epistemic validity or involved in active hybridization processes? The problem might be seen as casting doubt not only on the university institution as the proverbial site of instrumental thinking, but even on the university as the site for the co-production of techno-science and social/cultural systems. There is no clear formula for development.

The international “network” or “extended” technical system largely based on corporations which already exist today is basically a combination of internal corporate communications,
technical agreements, functional relations and informal exchanges. It is a system which provides access to international technical advances in particular fields, development areas or markets. Access is not as open as is claimed. Moreover, it takes place through existing links and available equipment. Although this certainly represents an opportunity and a challenge for the creative and dynamic management of knowledge, competition is so intense, and the resources required so complex and costly, that countries and institutions must resort to other mechanisms to operate effectively on a global scale. What role will the developing countries play in the new knowledge production system? Will they only be passive consumers of pre-digested information products?

What is already happening and will surely intensify with the growth of the education services sector is that, as a spin-off of the commercial expansion of higher education, universities in industrialized countries are selling virtual courses in packaged form and other educational products under intellectual property protection rules, with implications for higher education costs; institutions are being compelled to use an increasing part of their budget to pay for licences, copyright and other royalties associated with “knowledge commodities” and to purchase high-technology equipment and materials. The establishment of franchises or foreign branches is increasing because this represents both a safety valve for the saturated academic market of the developed countries and a highly profitable business owing to the incentives (tax, employment and market incentives) which can in fact be used for private investment in higher education in developing countries, in the absence of clear regulations on the subject. Thus, many higher education institutions in Latin America are being converted into subsidiaries, branches or façades for new commercial undertakings by knowledge institutions of the North, prepared to explore the latest frontier of knowledge: education services.

International scientific cooperation is part of diplomacy and when negotiations are being conducted between highly unequal partners, the possibility of achieving a fair deal is reduced. It may thus be observed, in the light of the role played by universities in scientific and technological development in relation to international cooperation, how the stock of knowledge and skills conserved by the weaker countries within their scientific and technical communities and in the institutions that store them – usually universities – is often minimized or ignored, and how this is reflected in the highly inequitable nature of the exchange networks available. Depending on the power and on the negotiating opportunities and skills of groups and countries, the cooperation programmes that result will be better or will be pseudo-programmes. The range of real solutions is enormous.

Therefore, in the current circumstances, with regard to knowledge and higher education as seen from the perspective of the so-called developing countries at this stage of globalization, rather than assuming relatively closed national communities and advocating analysis within the nation-State, it would seem more useful to adopt an explanatory approach which involves the recognition of a tension between homogenization and standardization, on the one hand, and national needs, on the other, in relation to the structure and construction of national knowledge systems. This tension, which is not new, but includes new aspects, is part of the current effects – both intellectual and social – of centuries of European expansion on the rest of the world and of the construction of modernity, in which science and technology and education systems, including higher education, have played an essential role.

7. Elements for a conceptual framework

In societies which have undergone profound transformations in the course of the last half-century and which now, in the context of globalizing markets, face serious development problems in a position of absolute or relative weakness, the knowledge institutions in Latin America, most of them in a state of constant instability, were compelled to move relatively rapidly towards
introducing innovations which elsewhere could be stretched out over a much longer period: for example, increasing the number of enrolments, democratizing access to higher education, creating and expanding scientific activity, professionalizing academic life and, more recently, redefining institutional relations with the State and society and integrating new models for the internationalization of culture.

Higher education and scientific knowledge have been a critical part of a highly unidimensional focus on growth and development. They may also play a crucial role in new institutional arrangements which recognize the interactions between socio-economic and natural systems, between science, technology and society and between disciplines, spread out over time and space, and which are capable of coping with deep and persisting uncertainties, even if we are just at the beginning of what promises to be the dawn of an era in which the study and management of complexity will be of central importance. At a time when the various forces in society are battling to impose their own cultural definition of modernity, what characterizes knowledge institutions in the region at present is precisely the variety of organizational projects and models seeking to gain legitimacy, quite apart from various existing traditions perceived as having validity.

Figure 1 illustrates the principal components of the conceptual framework. The notion of “moral social obligations” basically refers to the need to reduce poverty, to integrate socially marginalized groups and to generate employment. It should be made clear that, even if the question at issue here relates unreservedly and directly to the realities of the region, moral social obligations are not limited to its specific societies but concerns the entire world as a single global system. Strategies and interventions seen from the perspective of the functions of knowledge should be directed towards fulfilling these obligations to a reasonable extent and within a reasonable timescale and enabling different societies to participate in a world with different, albeit less unequal partners and to achieve a more socially responsible international community. A change in the requirements of national knowledge systems should also be provided for in the new scenarios by promoting a global awareness of interdependence and of our common destiny.

Some of the main forces for change are to be found in the economy, including the already mentioned globalizing trends, which affect the parameters and dynamics of trade, the markets and the regulatory framework and policies which may become more interwoven. However, social and political changes, including the increasingly difficult matter of governance and changes in institutional and legal frameworks, are also bringing about global and local transformations. By virtue of its capacity for discoveries, science has been a source of change throughout its history and, it may be expected, will continue to be so, even if science as instrumentalized at present is too closely associated with the workings of the economy, which reduces its potential effectiveness as it links it too closely with the dynamics of technological change. It remains to be seen whether science will continue to be instrumentalized or whether it will succeed in releasing its creative potential in a different operational context.
FIGURE 1

ANALYTICAL FRAMEWORK

Moral social obligations
- Reduction of poverty
- Integration of socially marginalized groups
- Generation of employment

Main forces for change
- Economic change (including globalization, trade, the market and the policy framework)
- Social and political change (including governance and the institutional and legal framework)
- Technological change
- Scientific discoveries
- Changes in lifestyles and behaviour

Functions of education and research
- Training and instruction (production, services)
- Ensuring a constant supply of researchers
- Provision of new critical knowledge
- Problem-solving (putting theoretical knowledge into practice)
- Cultural (cultural, aesthetic)
- New processes that will draw on and optimize various kinds of knowledge in higher education and research
Technological innovation will continue to be a force for change with a direct impact on economic and political developments. We are just now witnessing a massive increase in the growth of the information technologies. However, the democratization, social participation and economic development that such technological change was expected to bring continue to be elusive, when not thwarted by the harsh reality of social exclusion. The changes in lifestyles and behaviour which we are witnessing in vast areas of the world with the development of new patterns of consumption and of personal and group satisfaction, are another factor for change with a knock-on effect and may be shaped by the extent to which there is an awareness of a common destiny.

The forces for change affect in many different ways the functions of higher education and research as instruments in the formation of a particular economic and social model. The provision of critical knowledge is of fundamental importance for poor countries which need to overcome the formidable obstacles that hold back development. However, amidst the host of problems and shortcomings they face, it is not easy for the educational facilities commonly developed in such contexts to produce original thinkers who will explore hitherto untrodden paths – nor is this likely to happen. One of the basic functions of higher education is the teaching and training of professional staff, technicians and scientists. The problem of the skills gap occupies a prominent place on the agenda of many countries, including the industrialized countries, and in the case of Latin America is a serious problem on account of the burden of poverty and inequity.

The training of researchers is not a specific function of higher education, but rather a by-product of practical vocational training. Research itself and, consequently, researchers are of fundamental importance for the provision of the knowledge vital for society, both for the understanding of problems and as a means of helping to solve them. This is a role that is in no way out of the ordinary, but rather an essential social function, among others. Besides these training functions, higher education for many students today represents a way of gaining access to jobs that are not traditionally seen as intellectually demanding. There is a tendency to consider the employment prospects of university graduates in a more systematic fashion and this has resulted in an employment agenda covering such themes as changing employment markets, higher education and social mobility, the social functions of university degrees, graduate unemployment, varying employment opportunities associated with a particular field of study or institution, and the expectations and behaviour of employers.

The main lines of approach therefore involve consideration of knowledge systems, the management of research and the discussion of higher education and research as a public or a private good. These approaches are illustrated schematically in Figure 2.

The first line of approach involves recognizing that, at the present time, knowledge in its various forms – both basic and applied scientific knowledge, technological, economic and social knowledge and other forms of practical know-how – occupies centre stage, although this assumes conditions of application that are markedly different in the industrialized world and in the developing countries. A comprehensive analysis of the question in the light of the current challenges needs to cover both the continued existence of the systems of higher education and research (encouraging their transformation and updating) and the requirements of access and equity in seeking to achieve competitiveness and high standards for the benefit of society. There is a need to identify which factors limit or increase research capacities and which mechanisms may be established so as to increase access and the provision of higher education services to groups that are excluded or marginalized by poverty, thereby helping, *inter alia*, to generate a significant level of employment. Furthermore, there is a need to design and introduce new mechanisms and programmes that will promote and fund the research necessary to satisfy the needs and aspirations of different societies and transform existing societies.
It is as necessary for a poor country as for a rich one to define its knowledge requirements strategically and there is more than one way of doing so. Formal education and research must both have the capacity to enhance and eventually accommodate “other” forms of knowledge. Heterogeneity marks both contemporary societies and knowledge. Cities, regions and peoples speak, live and work differently, while their material and cultural well-being varies greatly. This is also true of their access to and, of course, their use of knowledge and information. The knowledge process too is complex and non-linear: it creates opportunities, it is versatile and multi-faceted, involving risks and movements. This leads to the emergence of new rules of behaviour, new types of people and ideas and, in some instances, old forms of knowledge and old structures are taken up again in unprecedented ways, expanded and improved as new forms, as may be seen, for example, in the fields of medicine, food and the environment.

The second line of inquiry concerns research management. At the interface between science and higher education, the focus of research management is twofold: research on the university and its social role through education, including the traditional agenda of what is known as the education sciences; and scientific research proper, designed to produce new knowledge about the natural and social worlds. The many attempts so far to evaluate the nature, scope and direction of the changing relations between science and higher education have revealed:
• the difficulties inherent in this type of study;
• the limitations of the various approaches; the need for an integrated view of the implications and consequences for sectors, products, types of training, disciplines, etc.; and
• a strong need for research in order to improve the store of knowledge at a transnational comparative level.

However, analyses, theories and new lines of inquiry and approaches abound today and, as a result, despite current uncertainties, there are some areas in which action can be taken with some degree of confidence. The areas of particular interest in this context relate to the problems of evaluating the performance of individuals in research and teaching and the evaluation of institutions. Debate is currently under way on whether or not the prestige and unilateral emphasis on performance indicators in academic research affect the teaching function or professional training in many institutional contexts.

Management can play an invaluable role in managing both the balances required and the crises, ensuring the maximization of participation quotas, negotiation, flexibility/pluralism and an appropriate context in which to achieve higher education and research goals. But management alone cannot work miracles; competitiveness cannot be achieved or recovered nor can a society’s standards of living be improved merely by injecting management science into a country’s institutions or into a country as a whole. Other components, which are frequently not taken into account when devising strategies for change, are also needed. Large amounts of funds are required; it must be possible to build new units on the periphery of existing institutional bodies and there must be consensus or shared beliefs among groups, departments and schools that are influential in the institutional context.

Interpretations of the links between management and “success” in academic and scientific work are usually vague and insubstantial theoretically and analytically; the real world is neither as simple nor as linear as many would wish; more management does not necessarily mean more growth and more growth does not necessarily mean greater efficiency; many of the managerial and administrative changes made in various Latin American countries as part of the State’s modernization or the introduction of modern management have either resulted in modest gains or were an integral part of the processes of privatization and transnationalization that eroded the modest gains that might have been obtained by applying “modern management” practices.

The third central theme concerns public and private property in relation to knowledge, and higher education and scientific research in particular. Commercial bodies now play a growing role in contemporary higher education in the areas of teaching and learning as the so-called “new providers of education services”. It remains to be seen to what extent these relations between the commercial and non-commercial sectors of education will have to be developed in the future, what form they will take and whether they will be competitive or complementary. There is a constant rise in the number of companies providing a growing range of not-for-profit services to higher education institutions, including the provision of learning management software, the marketing of online courses and programmes, the creation of electronic portals to promote particular universities overseas, the development of customized course designs and the provision of specialized fields of study, in addition to performing the most diverse functions in university administration, from libraries and scientific documentation centres to the automatic staff payroll and internal accounts management. To date, the reaction of the region’s academic community has been limited and weak, except in Brazil. Some argue that this is due to the lack of information since negotiations are not conducted through the ministries of education but through those of trade and foreign affairs, but it is also proof of the weakness of the academic communities, which are losing the monopoly in the field of education.
Relations between the public and private sectors of higher education and scientific and technical research are changing, following the trends in the more industrialized countries. It remains to be seen whether, as in those countries, a complex of semi-public organizations, independent regulatory agencies and joint public and private policy networks will develop or whether public activity will quite simply become a free-for-all with no clear rules, which will eventually sweep away what remains of the public sector. There is therefore an urgent need for more in-depth discussions to be held in the region on matters such as how labour might ideally be divided between the universities, industrial enterprises and governmental research laboratories. The commercial initiative in the higher education sector, including the public sector, may be regarded as an institutional attempt to regain freedom of manoeuvre in response to the loss of the autonomy enjoyed previously. In addition to these initiatives there are the so-called business or corporate universities, in which the transmission of academic knowledge is somewhat secondary, since their primary role is to monitor change in businesses and train senior managers.

Latin Americans, whose productive capacity has gradually been dismantled in the last two decades through the privatization and closure of firms and the loss of their national economic and political sovereignty, should think about the requisite level of autonomy that they should attain in order to participate in globalization processes. Despite the illusions and myths about a universal identity that will be the outcome of globalization, peoples and systems of government will continue to be different for a long time, and the most difficult task of our age will probably be to identify the conditions that will lead to a productive and peaceful coexistence. Techno-science and higher education, which have traditionally been instruments for universalizing a hegemonic modernizing project, seem increasingly to be at one and the same time arenas for negotiation, loans and exchanges, displacement and reconfiguration of transnational processes.