PROSPECTS: KNOWLEDGE-BASED DEVELOPMENT AS AN INCENTIVE FOR EDUCATIONAL INNOVATION

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Abstract

The increasing volume and diverse character of the demand for learning bring about changes in the infrastructure for educational services. As the strategic role of local knowldege in development continues to be recognized and understood, the information sector may well emerge as a policy-planning and decision-making framework to cultivate, raise and broaden the local knowledge-base. Some of the major prospects for education and informatics come into focus and are understood as concepts, such as science and technology, learning and development, and are expanded to reflect deeper insights and new realities. No single organization or individual can predict all the positive and negative implications of education and informatics. In order to ensure that change in the information sector and the educational enterprise responds to local needs, resources and aspirations, national and international co-operation should focus on strengthening the ability of Member States to organize their autonomous capabilities for understanding, integrating and guiding change. This paper explores through the lens of knowledge-based development a) some of the major prospects for mobilizing the learning force through education and informatics and b) an approach for strengthening international co-operation in ways which contribute to cultivating, raising and broadening local knowledge as a strategic resource.

"As health, strength, vigour and vitality are bodily goods, so information, knowledge, understanding and wisdom are goods of the mid-goods that acquired, perfect it.

A moment's reflection will discern that these four goods are not coordinate, not of equal value. Rather, as just named, they ascend in a scale of values, information having the least value, wisdon the greatest".

Mortimer J. Adler

A Guidebook to Learning: For the Lifelong Pursuit of Wisdom (New York, Macmillan, 1986)

Introduction

The way a problem or phenomenon is defined determines the manner in which it is confronted, and the resources used to address it. If the definition is too broad, resources will be insufficiently focused. If the definition is too restricted, the roots of the problem, phenomenon or process may be missed. The prospects one sees for education and informatics depend on the filter through which they are perceived. Knowledge-based development -a different way of looking at the familiar- is the filter for the following discussion.

Education systems and informatics are delivery technologies. To focus on them alone is to miss the point that their value is derived from their capacity to satisfy the diverse needs of people to find out what they need to know, in a timely, reliable and economical manner. As the demand for knowledge changes, so will the structure of education and the applications of informatics technologies.

It often appears that even though more and more information is becoming available, people tend to feel they have less and less access to the information they need. Yet, at the same time, there are an increasing number of efforts to evolve alternative socio-economic mechanisms which facilitate individual access to information on a timely, reliable and economical basis. Knowledge-based development focuses on a) promoting the type of innovation which will create practical and dynamic mechanisms to facilitate availability and access to information, so that people can construct the knowledge they need in order to improve the quality of their lives and b) promoting understanding of the production, distribution and use of information as an economic activity.

A discussion of education and informatics is, in essence, part of the ongoing debate in each society regarding the decision as to where and how to strike a balance between stability and transformation, between control and freedom, or between being an open or closed society. A society's attitude towards knowledge is revealed by this balance. This discussion will not attempt to suggest where these balances should be: that is a sovereign political decision which is, in effect, the accumulated decisions made continuously by the various complimentary and conflicting individuals and institutions which constitute a society. These decisions on the access which the members of society have to the information which they need to build knowledge. Consequently, the capacity of a society to guide change depends on the dynamism and practicality of its information sector to respond to the diverse information and learning needs of the society.

This balance is defined neither by a point nor any single organization. Rather, the balance is reflected in a set of institutions, standards, laws, professions and practices which characterize the organizations involved in the production, distribution and use of information. The manner in which a society cultivates, raises and broadens its knowledge-base is reflected in the character of its information sector.

Knowledge-based development is an integration concept which reflects fundamental linkages between such concepts as science and technology, education, learning and socio-economic development. This paper discusses some of these linkages and their implications for strengthening international co-operation.

Development as learning

Conditions exist which require reassessing certain basic assumptions about development and education: there are more learners, a scarcity of good teachers, diverse learning needs, limited resources and a need for improved quality. If development is to be understood as learning, as Soedjatmoko, the former Rector of the United Nations University has eloquently stated on various ocassions, then the only realistic way to address the enormous challenge is for new mixes of a society's resources. The challenge to policy planners and

political decision makers is to create a framework which encourages the society to evolve a high-quality, efficient and learner-centred infrastructure for the broad educational enterprise. The framework for policy formulation must be expanded by the recognition that learning takes place throughout a person's lifetime and that schools are just one of many providers of educational services.

The combination of formal and informal and of public and private organizations which emerge to respond to the diverse learning requirements that the members of a society have throughout their lifetimes are part of an educational enterprise which, in turn, is part of the information sector in the economy as defined by the Organization for Economic Co-operation and Development (OECD). The information sector is the means through which a society expresses itself culturally, educationally and scientifically. This sector functions just as the feedback mechanism does in any dynamic system; it reinforces the capacity of a system to operate (positive feedback) and provides a means for achieving new conditions of equilibrium (negative feedback). Positive feedback of information is essential for a system to operate. Negative feedback is essential if a system is to adapt to change and achieve new equilibrium.

Education and informatics have this dual role. Educational service organizations help people earn their livelihoods while at the same time help us all to become life-long learners. When viewed in this manner, there can be greater appreciation of the profound opportunity, given the political will, that information and communication technologies offer for cultivating the richness of cultural tradition in each society while building on that tradition in innovative ways to meet the changing needs of the members.

As we focus on issues raised by education and informatics, it is important to realize that the social response to learning is a relatively new phenomenon. It has only been approximately 200 years since societies began to make a commitment to ensuring a minimum educational level for all their members. Therefore, it should not be surprising that those of us interested in ensuring that learning opportunities exist for more and more people have as much to learn about how to improve the availability of those opportunities.

The "goods of the mind"

The confusion which arises in the discussion of such related topics as education, learning, information, science and technology, knowledge and development is inevitable. Similar processes and phenomena are described by different terms in different communities. The historical and fundamental challenge of information and communications technologies has always been and continues to be improvement of the very skills which make humans unique among living animals: creativity and communication.

Refining these skills is also essential to improve understanding among the various disciplines addressing the "information phenomenon".

It is through the widespread social application of these creative and communicating skills that issues are articulated and decisions made regarding the values that will guide how a society chooses to use the insights of science and the application of technology.

As extensions of our senses, information and communications technologies provide the means to learn about learning, think about thinking, speak more about speaking and listen more about listening. Simple technologies cannot be used if a person does not have a basic level of writing, reading and speaking ability. Information or communications technology will not be useful if the learning motivation in each person is not recognized and cultivated.

What some call the "information age" is but the latest manifestation of this ongoing phenomenon; people realize that they must change themselves to survive and to improve

the quality of their lives in the new environment in which they find themselves. The more profound the changes, the greater the need to know, and the larger the increased demand on educational services.

The hierarchy formulated by Mortimer Adler (referred to at the beginning of this paper) helps clarify the meaning and relationship among some of the key terms being used in this discussion. Learning is what enables people to become mobile along this hierarchy. A closer look can help bring some of the prospects for educational and informatics into focus.(See diagram below).

There is another set of terms which require clarification. Learning and education are different. Learning is a process experienced by the user; it reflects the demand side of the equation. Education is what is provided to the learners; it reflects the supplier's point of view. Individuals and institutions must be both learners and educators. The challenge for those involved in formulating comprehensive human resource development policies in general, and educational policies in particular, is to encourage the evolution of various practical and dynamic mechanisms for matching learners and educators.

The roots of knowledge-based development

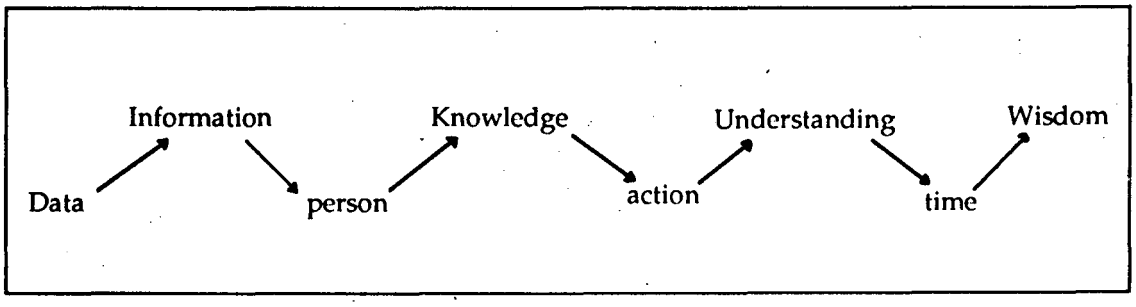
Knowledge-based development has deep roots in the overall process of development.

At times it appears that development planning approaches, models and methods are part of the problem rather than part of the solution. The prevalence of poverty, debt, ignorance and avoidable diseases as well as the continued degradation of the environment with its tension between human society and the natural surroundings, emphasize the limits of existing development approaches. Continuous reassessment and testing of the assumptions underlying these approaches is essential.

Reassessing the role of science and technology in society can assist in renewing development planning approaches. Science and technology function in different environments but are linked by their relationship to information and to an expanding local knowledge-base. **Knowledge-based development links science and technology to economic and social development.**

Science is the Latin word for knowledge. It is more than an insight which expands what is known and knowable about nature. It is an attitude towards learning, knowledge and invention. For the early Greeks, technology was "any (hu)man-made devise, process or logical technique designed to produce a reproducible effect". Technological advancement can be understood as increasing the information content of devices, processes and techniques to meet changing needs. Respect for and expansion of the local knowledge-base are essential factors for promoting science and technology and for ensuring applications are consistent with local needs, conditions, resources and aspirations.

Advanced or "high" technology can be understood as technology with high information content. **The emergence of advanced tech-**



nology is a product of and contributor to the shift in the qualitative and quantitative balance of the material and non-material resources required to sustain a process of autonomous development. The capacity for development is enhanced through the simultaneous cultivation of material and non-material resources. Development required strengthening the infrastructure for cultivating physical resources (land, materials, plants and energy) and intellectual/creative resources (those which build human capital). Those development planning approaches that emerged when material and non-material resources had different relative values, may no longer be appropriate. Continued acceptance of the assumptions on which such approaches are based are likely to weaken the overall capacity of a society to transform itslef. It may well be that the "solutions" which stress physical infrastructure projects are part of the problem.

An economy can be divided into two domains, according to Marc U. Porat and Michael R. Rubin in their study entitled The **Information Economy: definition and measurement.** One domain of the economy transforms material resources and energy from one form to another. The other economic domain transforms information from one pattern to another. There is a symbiotic relationship between these domains. Matter and energy are transformed by increasing information content. Similarly, information patterns are carried by the media and energy. The question is to measure the relative contribution of each pattern to wealth.

This shift in the qualitative, quantitative, physical and intellectual balance is rooted in the growing recognition that:

> the ability of a society to add value to material and non-material resources is the key for generating local wealth and an important factor in contributing to a more equitable distribution of new wealth (information sector hypothesis).
>
> To add value is to add to the information content of resources. As more and more human beings add value to themselves by building knowledge (see Adler) through education, experience and skill development, they are better able to increase the value of technological and other resources and also to increase their purchasing power to more effectively satisfy their basic and other needs.
>
> By adding value to information, the information organizations enhance the capacity of their users to add value to other resources and, together, contribute to economic growth.
>
> Development could be understood as enhancing the capacity to add value to the factors of production so as to meet the material and intellectual needs of all members of a society.
>
> An economy adds value to resources through its information sector. The information sector is the planing framework for implementing a knowledge-based development strategy. The information industry is a major component of this sector because of the efficient way it adds value to raw data by putting it in formats which make it easy to access precise and reliable information on a timely and cost-effective basis. As an economy incresases its capacity to add value to the factors of production, it can transform itself from one that is dependent on the export of raw material to one of greater diversification.
>
> The information sector can be understood as the supplier to the only knowledge producers -human beings- in their economic, political and social roles.
>
> Peoples must inform (educate if you will) themselves in order to apply new knowledge to the other factors of production. It is here that we address the dual role of education.
>
> The educational entreprise is part of the information sector. It has characteristics and capabilities that are similar and different. This is the focus of the next section.

Formulation of these hypotheses rests, in part, on the results of macro-economic studies undertaken by the OECD and a limited number of similar studies in non-OECD member countries regarding the portion of the information sector in GNP, the percentage of information workers in the labour force and the impact of information trade on total foreign trade service. OECD methodology is based on the Porat/Rubin methodology refered to previously.

The growth of the information industry and the information market-place, the educational enterprise and educational market-place makes the difference between a society immobilized by either too much or too little information and a society which respects, expands and enhances local knowledge, raising and broadening human capital in the process. The growth of the information sector is an indicator of a society's capacity to increase human capital. This does not mean making people more productive for a system that exacerbates differences; rather, it is a measure of human capacity to meet their basic needs.

This is not to suggest that there is a "gap" between developed and developing societies, since not all societies need or should follow models of any other society. The real measure and character of a society is in the degree to which it facilitates and enables its members to meet their basic needs and hopes for an improved quality of life. Neither is it suggested that "informatization" is the solution for developmental problems. Whast is suggested is that the recognition of the information sector adds a new component to the formulation of development strategies. If we speculate that the information sector is the "fulcrum" of development, it could be argued that growth of the information sector in the North was stimulated by growth of the agricultural, industrial and service sectors.

Whereas, in the South, it could very well turn out that incentives for information sector growth provide incentives for increased productivity and growth in these sectors. Needless to say, this is a two-way process, but recognition of subtle shifts of emphasis can have a profound effect on the formulation of development strategies.

Knowledge-based development underscores the role of human resources in automous development, wherein local demand provides an incentive for adding value to local resources. Shifting priorites for cultivating, raising and broadening local knowledge can have a profound effect on the educational infrastructure.

The learning force and the educational market-place

Promotion of innovation "in" educational services requires an "innovation" in how the role of educational services is perceived by society.

A major driving force behind innovation in education is that the expanding and diverse learning requirements of the members of a society exceeded what the formal educational systems were set up to provide. As more and more people become involved in learning activities, the educational market-place expands. In response to this demand, new organizations emerge with the intention of enhancing the capabilities of the educational enterprise.

To cultivate, raise and broaden the local knowledge-base requires a pluralistic educational enterprise and a dynamic educational market-place. The concept of an educational enterprise acknowledges the diverse combination of separate organizations which emerge to meet the learning demand which the members of a society have throughout their lives. The education enterprise is the cornerstone for a larger human resource development policy. An educational market-place brings learners together with the educational service organizations and individuals in the educational enterprise. Although an educational enterprise has always existed, access to it varies because

not everyone has the resources to participate in the educational market-place.

The terms "learning force", "educational enterprise" and "educational market-place" are being used for two reasons. First, to suggest something more than that infrastructure which comes to mind when words such as "university", "school" and "training programme" are used. Secondly, to suggest that we do not confuse the preservation of a set of institutional relationships with the social function it was set up to satisfy. Since it is not known what form the infrastructure of educational services in each society will take, it is important to maintain focus on the social function -responding to increasing and diverse learning needs - and let the structures evolve.

Public policy formulation with respect to knowledge-based development focuses on promoting fair, dynamic and pluralistic educational market-place mechanisms which reduce barriers to the access to quality services offered by the educational enterprise.

Knowledge-based development acknowledges that the role of the state is shifting from being the predominant provider of educational services to one of ensuring that all individuals have the minimum resources to exercise choice in the educational market-place and thereby gain access to quality educational services.

Economics is a crucial component of the educational enterprise. Currently, the educational market-place reflects the range of combinations for funding: directly from the learner or indirectly through an organization such as an employer and/or a Government. Neither approach is better than the other, and what may be appropriate for one situation may not be for another. The basic point that needs to be kept in mind is that the way education is paid for determines who controls the proces, the level of its quality, who has the right to chose what is worth learning, what options are available and what are the costs. An educational market-place, while part of a larger information market-place, has functions thát make it different as follows:

- The information market-place provides an economic incentive for providing information for market niches for business decisions previously identified. It considers individuals in their roles as earners of a livelihood. The value of the information depends on what is at stake in the decision to be made. The focus is on decision making.
- The education market-place provides the economic incentive for mobilizing all resources that help learners develop skills to build knowledge, including knowledge about how we know what we know. It considers individuals as learners. Changes in information demand and in the capacity of information and communications technologies are bringing about a fundamental restructuring in the economics of information processing. This process has only just begun. The focus is on the learning process.

New mechanisms are emerging from the educational market-place which permit more and better matches between learning demand and the capacities of the educational enterprise. An "unbundling" of the educational enterprise may be occurring. The educational enterprise is made up of several different activities which are carried out by a combination of organizational relationships. "Unbundling" involves dis-aggregation of the various functional activities which are part of the infrastructure of the educational enterprise. Unbundling shifts the emphasis of the role of government, it does not do away with it.

Prospects possible for the further institutional "unbundling" of the Educational Enterprise are likely to continue in the following areas:

- Quality control (from emphasis on the institutional supplier to emphasis on the learning achieved)
- Managing the learning environment (from administratively-driven to teacher-learner centred)

- Financing and economics of education (from funding the supplier to ensuring that all have the resources to exercise choice while maintaining that sufficient incentives exist to provide quality services).
- Administration (from standardazing approaches to encouraging diversity)
- Curriculum control (shifting the decision from how to learn and at what rate to the learner)

These thoughts should not be interpreted as suggesting that public provision of educational services be replaced by private organizations. There are limits to public funding of efforts to mobilize the learning force. What may be emerging is the mobilization of the learning force through a pluralistic educational market-place, with both public and private provision of educational services throughout the lifetime of all members in society. The exact mix will vary according to such factors as local conditions, the needs of each society, the goals of each educational service, and the subject matter. Possibilities may increase for a learner-centred, efficient and pluralistic educational enterprise.

Education and informatics

A reassertion of the role of the learner-teacher relationship in the educational enterprise is the basic prospect for education and informatics when viewed through the lens of knowledge-based development.

In essence, the application of informatics technologies in education should liberate teachers to use their full potential. Teachers are usually trained to focus on the idividual as a learner; to build on the learner's motivation; to encourage the self-development of the learner's skills; to determine what is important to know; to provide incentives to make conceptual links among ideas, symbols and experiences; to encourage learner's to imagine, to wonder and to be courious; to be as confident and proud about what one knows and does not know. In surviving in an information-rich environment, knowing how to formulate the right questions becomes the "compass" to find the information to build kowledge. Teachers and teacher-motivated interaction is essential and can not be duplicated. Liberating teachers from routine to reinforce the excitement of learning is perhaps more an ideal than a prospect, but ideals are great energizers. The cultivation of these qualities and skills in the educational enterprise are critical as information-transfer and knowledge-building become a larger part of our lives.

The realization of this prospect is not inevitable, nor will it take shape in the same way or at the same rate in all societies. As local knowledge emerges as a strategic component of development, the infrastructure of the educational enterprise has an oportunity to transform itself.

If the shape of the educational enterprise is to reflect the needs, conditions, resources and aspirations of each society, the political will to mobilize the learning force must be accompanied by a public policy of commitment to innovation. The educational enterprise is not static; change in society and in the educational enterprise reinforce each other. The process is ongoing. Innovation is not an end in itself nor does it have value for itself alone. It does have value to the extent that it produces knowledge upon which decisions can be made as to what changes are most appropriate.

A commitment to innovation (itself a means for building knowledge) is much more important than any prediction on prospects that might be made. Innovation involving education and informatics are likely to address at least some of the following:

- the changing relationship between knowledge and the learner
- respect for local knowledge
- a shift in the balance between the information transfer function and the knowledge-building function in the educational enterprise

- building trust, encouraging co-operation and mutual respect, as well as promoting a capacity to risk acknowledging what is not known, become a major thrust of the educational enterprise.
- the changing concept of literacy
- increased integration between the functions of the teacher and librarian and between the library and other learning environments
- decentralization of curriculum control

The character of the information sector and the educational market-place determine the character and rate of change of a society. If they are responsive to the diverse needs of the society, change is more likely to be smooth, continuous and responsive to local needs. If they are not, change is likely to be abrupt, dramatic and respond to special interests. No single organization or individual can anticipate all the positive or negative implications of education and informatics. In order to ensure that change responds to local needs, resources and aspirations, national and international co-operation should focus on strengthening the ability of Member States to develop autonomous capacity to enable them to understand, integrate and guide change. This is the subject of the next section.

Strengthening international co-operation

Countries are confronted with decisions regarding servicing external debt or investing growth. To consider this an "either or" question is to miss the opportunity in the crisis. Knowledge-based development refocuses this dilemma by offering the possibility for the creation and distribution of new wealth, locally and more equitably.

The differences between the so-called information-rich and information-poor countries (that is, those committed to human resource development and those that are not) may well be exacerbated by the absence of a knowledge-based development. The dichotomies between information-rich societies with illiterate populations and information-poor societies and their information-elite are real, but their existence need not be considered inevitable. These differences, as well as the character of information flows between societies can be traced, in part, to the absence of the appropriate knowledge-based development strategy in each society.

It is not the role of international bodies to decide the character of the information sector; that is a sovereign decision. However, international organizations can demonstrate development planning approaches which a society might decide to apply as a way that would enhance its capacity to produce the knowledge needed to make decisions about the information sector. Change is more likely to be consistent with local needs, conditions, resources and aspirations as this capacity is enhanced.

The search for an appropriate approach to information in development seems to be at an impasse. Consensus on an acceptable, workable and practical approach for integrating the information phenomenon into development planning has not been achieved. Meanwhile, the search remains fragmented. As a result, local knowledge resources are not sufficiently mobilized in ways which allow each society to change itself.

A conceptual breakthrough is needed to release energies and resources which improve the effect of existing programmes and create a framework on which new efforts can be built. Knowledge-based development might benefit from a critical examination in this context. For International co-operation to contribute to strengthening the local capacity of societies to anticipate and guide change, international bodies involved with various aspects related to cultivating, broadening and raising the knowledge-base in Member States should examine areas of co-operation which seek a comprehensive development-planning framework.

To promote knowledge-based development is not to suggest national or international organization involvement in the production, distribution and use of information. Knowledge-based encourages the production of knowledge about the socio-economic mechanisms which cultivate, raises and broadens the local knowledge-base. International co-operation in knowledge-based development could involve perfecting tools and techniques for integrating this phenomenon into development planning.

The importance of knowledge-based development is implicitly acknowledged in the separate programmes of international organizations. Most of the organizations and agencies are involved in one way or another with some aspects of the information phenomenon. Cooperation is essential to demonstrate the full import of this phenomenon and to reinforce the ongoing programmes in each organization. Each organization sees a legitimate and important but inevitably partial view of this mosaic of knowledge-based development. There are opportunities for organizations of the United Nations system to work together on this complex subject.

The need for inter-institutional co-operation is essential at local, national and international levels in order to fully identify and understand the information phenomenon. **Knowledge-based development requires new mixes of resources rather than the infusion of large sums of money.** The problems and the opportunities cut across many existing institutional arrangements.

National or international development organizations are not neutral in the growth of the information sector, globally or locally. Their vast activities in the production and distribution of information make them major actors in the development of local information sector capabilities. The basic issue is whether or not international organizations (with the focus on physical infrastructure projects) will recognize and transcend their traditional role and, in conjuction with Member States, begin to examine approaches which can be used to promote and encourage the growth of the local information sector as a component of the economy, as with the agricultural, manufacturing and service sectors.

In June 1986, the United Nations Centre for Science and Technology for Development prepared an internal draft paper entitled "Towards knowledge-based development", which it circulated for comments to organizations of the United Nations system. **The Centre's effort stemmed from the recognition that knowledge-based development links science and technology with economic and social development.** The approach formutaled by the Centre stressed:

- Refining and perfecting approaches, techniques and methodologies which focus comprehensively and in a practical manner on the information phenomenon and, thereby, permit it to be integrated into development planning.
- Examining alternative development strategies which might integrate the information sector as an explicit component of development planning, as with the agricultural, manufacturing and service sectors.
- Promoting inter-institutional co-operation as a central aspect of policy research and planning for knowledge-based development.

To have any hope of cultivating and raising the local knowledge-base requires an interdisciplinary perspective towards the production, distribution and use of information and involves the combination of many different disciplines. Consequently, policy formulation involving the cultivation of knowledge resources in a society requires an interdisciplinary focus. Such a focus would complement the current discipline-oriented and media-oriented approaches. Although the members of the information sector are part of the same

family, they speak different languages to describe similar and related phenomena and, when they speak to each other, which does not necessarily occur as frequently as needs require, they do not understand each other.

A "knowledge-based development strategy" does not involve the creation of any thing new. Rather, it is a more comprehensive framework for formulating and implementing development programmes in ways which mobilize local capabilities for the production, distribution and use of information. Publishing, communications, computers, consulting and research, as well as extension agents, teachers, managers, investment analysts, engineers and architects are all part of the information sector (as defined by OECD). The current trend towards privatization/deregulation/restructuring of telecommunications is occuring in large measure since the monopoly structure of these services is insufficient to meet the mushrooming and diverse demand for information in a society.

A possible step for strenghtening international co-operation would be to update the conceptual planning document prepared earlier by the Centre. This would involve a co-operative effort among the organizations of the United Nations system to examine each of the horizontal elements of the information sector and the linkages between them. These links include:

- Technology
- Economics (industrialization, trade and finance)
- Legal, regulatory and information management standards
- Human resource development planning
- Organization and decision making

In order to mobilize the learning force through the educational enterprise, consideration might be given at the national level to form an inter-institutional co-operative effort in the form of strategic councils for the learning force. These councils might comprise all existing public and private organizations that are involved in or effected by human resources development policy. It could also serve as the human resources development portion of knowledge-based development planning.

The strategic councils for the learning force could be somewhat similar to the Strategic Council for Educational Development proposed in the report

Corporate Classrooms. The councils would take a comprehensive view on a sustained basis. Their three major responsibilities would be:

To assess a nation's emerging educational needs

- the focus would be on the diverse learning demand in the society.

To identify and review educational resources

- to focus on the different educational service sectors and discover how they relate to one another. The roles of schools and colleges and adult education would be evaluated along with corporate education. The training programmes of labour, government agencies and the military are also vital to the review. Finally, educational oportunities must be assessed with the new technologies and delivery systems in mind, and with instructional materials emanating from the learning industry.

To recommend policies and programmes

The original proposals of the Centre could be updated and expanded as a basis for a longer term project. The proposed effort among organizations of the United Nations system would have a counterpart at the national level. Co-operation would focus on examining the characteristics and parameters of knowledge-based development. The long-term project

might be called "Minerva", after the Greek goddess of wisdom. The basic proposal is not to change but to build on what has been done before; to shift emphasis rather than to go to an extreme approach; to complement and revitalize separate programmes with a comprehensive framework; and to move forward by looking inward.

Perhaps, the World Bank or the United Nations Development Programme might provide the funds to prepare the reference documents around which the possibilities for inter-institutional co-operation might be examined.

Conclusion

All societies are experiencing profound change. The challenges are exiciting to some and threatening to others. Access to the information needed to produce knowledge is one option that could produce uncertainty, involve more people, and shape change. These demands have already begun to change the structure and focus of the information sector at local and global levels. Inevitably, each society has the option to cultivate, raise and broaden its knowledge-base or risk losing control of its own destiny.

In essence, what distinguishes societies, just as it distinguishes people, is their attitude towards knowledge. We are not living through a revolution of machines. There is no absolute truth. What we are living through is a philosophical revolution which is the counterpart of the scientific breakthroughs of this century. We are redefining our species by its diversity. There is a richness in all beliefs. Survival as a species and the hope for an improved quality of life depends on how much we can learn from each other and on how well we co-operate at the local level in addressing global problems.

We are entering a world that depends more and more on the movement of ideas and less on the movement of goods. Development is becoming descentralized, with those who are affected by policies and decisions becoming more involved in the formulation of those policies and in the decision making. This trend can, in part, be traced to the changing value of knowledge and the appropriate local application of informatics technologies. Knowledge-based development acknowledges this trend and promotes understanding of it.

The global village is a glove of villages. We are all partners in building the infrastructure of this global community. We may not know each other's names, but we are slowly learning that what one person does in one corner of the planet will affect his or her counterparts elsewhere. We may be unfamiliar with the details of each other's culture, but hopefully we will realize how fundamental it is that we all learn from each other.

Whether future generations accept the challenge to develop new patterns of global co-operation, or run from it, will depend on how they approach learning. Using information to build knowledge requires trust, co-operation, respect and interdependence. If these qualities characterize the process involved in building the information infrastructure of the global village, then perhaps there is a change, the relations between our local and global communities might have these same characteristics.

Coda

"The universe is what we say it is. When theories change the universe changes. The truth is relative."

"If there is no priviledged source of truth, all structures are equally worth assessment and equally worth toleration. Relativism neutralises the views of extremists of all kinds. It makes science accountable to the society from which its structure springs. It urges care in judgement through awareness of the contextual nature of the judgemental values themselves."

The Day the Universe Changed
James Burke
Little, Brown and Company
New York, 1985.

Selected references

Adler, Mortimer P., **A Guidebook to Learning: for the lifelong pursuit of wisdon** (New York, Macmillan, 1985).

——. **The Paideia Proposal: an educational manifesto** (Macmillan, New York, 1982).

Carbonetto Tortonessi, Daniel and de Cabellos, Carazo, **Heterogeneidad Tecnológica y Desarrollo Económico: El Sector Informal.** (Fundación Friedrich Ebert for Instituto Nacional de Planificación, Perú. 1986).

de Soto, Hernando in collaboration with E. Ghersi y M. Ghibellini. **El Otro Sendero** (Instituto Libertad y Democracia, Perú, 1986).

Eurich, Nell P., **Corporate Classrooms: the learning business,** (Princeton, New Jersey, Carnegie Foundation for the Advancement of Teaching, 1985).

Central Bank of Venezuela, National Scientific & Technological Research Council, the Central Office for Statistics and Informatics of the President, Central Office Coordination and Planification of the President, **El Sector Informativo en la Economía Venezolana: hacia su definición y medición** (Caracas, 1983).

Organization for Economic Co-operation and Development, **Information Activities, Electronics and Telecommunications Technologies: Impact on Employment, growth and change,** vols. 1&2, (París, OECD, 1981).

Porat, Marc U. and Rubin, Michael R., **The information economy,** Executive Summary of nine-volume study for the Office of Telecommunications (Washington, D.C., United States Department of Commerce, 1977).

Roth, Gabriel, **The Public provision of private services,** an EDI Series in Economic Development (Washington, D.C., Oxford University Press, 1987).

Soedjatmoko, **Work in Progress,** vol. 9, Nº 1 (Tokyo, United Nations University, 1985).

United Nations Centre for Science and Technology for Develoment, **Atas Bulletin: new information technologies and development,** Issue 3 (June 1986) United Nations publication, Sales Nº. E. 85.II.A.18).

Vitro, Robert A., "El sector informativo en el desarrollo económico y social", **Chasqui — The Latin American Magazine on Communications,** Nº 8 (October-December 1983), pp. 83-88.

——., "The Information Engine" **Managing International Development,** vol. 1, Nº 1 (January-February 1984), pp.24-39

——.,"Towards a Knowledge based development strategy", UPDATE, Nº 29, April 1987, United Nations Centre for Science and Technology for Development, United Nations, New York.