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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION



A conceptual framework for Industry - Tertiary Education Linkage

*Consultant Task Force Report
Background Paper for the Workshop
on Industry*

**UNIDO-UNESCO-UNIVERSITY:
JOINT PROGRAMME FOR INDUSTRY-UNIVERSITY LINKAGE**

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I. BACKGROUND

People have the capacity to accumulate knowledge and to transform ideas into tangible objects. This trait is essential for innovation and the ability to manufacture goods and services ranging from simple objects to complex technology systems. The challenge is to create an environment where people can freely gain access to tools with which to transform ideas into tangible objects, and to translate these experiences into an economically viable and sustainable occupation.

The depth and scope of human resources available in an economy plays a critical role in defining the pace and sustainability of economic growth and development. This condition is true for both developed and developing economies. However, the issue becomes more acute for economies where the prospect for supporting economic growth through large-scale industrial and manufacturing activities are not a viable option. In this respect, matching the human resources output of universities against the needs of industry, particularly in strategic sectors, can help define the future growth of developing economies.

Recognizing the critical role for an effective industry-university linkage to support economic development, the Human Resources Development Branch (HRD) of the United Nations Industrial Development Organization (UNIDO) has worked closely with industry to design and implement HRD programmes to help translate the human resource base of university graduates into viable and sustainable employment. To achieve such an objective, UNIDO has formulated a unique industry-university linkage programme called the "Graduate Resources Integration Programme" (GRIP). GRIP utilizes comparative advantages offered by UNESCO and UNIDO, local universities, industry and other players in industry, and applies these factors within the context of a dynamic input-output model to help match the supply-demand needs associated with HRD.

I. Changing Pattern of Global Industries

For most people raised in an era where industrial manufacturing and automation defined the growth prospects of an economy, foregoing the economic advantage of scale is viewed as equivalent to economic suicide. However, by design, the diminutive domestic markets capacity of certain developing economies prohibit most large-scale volume production to take place. In this respect, conventional wisdom suggests that economic growth in these countries will forever be bound by pre-existing conditions. This is not the case, however.

In an era of mass production and automation, a premium was placed on large scale production. However, in the Information Age, access to market information has dramatically changed the ways in which industry and consumers demand products and services. Specifically, product life cycles are becoming shorter, and demand for customized service, and tailored products are on the rise.

It is increasingly recognized that, under current conditions in the Information Age which has dramatically changed the ways industry responds to consumer demands, remaining competitive in a globalized market environment requires enterprises to become more flexible and responsive to client demand. In many industrialized countries, this flexibility is realized through greater decentralization, i.e. creation of small profit centers within medium- and large-scale enterprises, and through extensive subcontracting. The belief that smaller production units are better able to recognize and adjust to changing market demand, more responsive to shifts in differentiated product mix, easier to re-tool, and have flexible management and labour force, which often encourage entrepreneurship, are some of the underlining principle behind this strategic move.

In this respect, the inability to realize large-scale production is no longer a handicap to economic growth. To the contrary, versatile and smaller production units have become a virtue. Thus, what was previously viewed as a negative factor to economic growth can perhaps be re-defined as a positive attribute to help direct small and medium enterprises in developing economies towards a new growth path.

The remaining barrier to growth, however, is the fact that the current market infrastructure of many developing economies are not able to support their own populations. This has resulted in the export of their most precious asset, its *people*. Consequently, one of the primary objectives of an industry-university linkage programme should focus on slowing down, and eventually controlling the hemorrhaging of intellectual assets.

II. CONCEPTUAL FRAMEWORK FOR ADDRESSING CATALYTIC LEARNING AND CAPACITY BUILDING ISSUES IN HRD

Operationalizing an effective human resources development (HRD) programme for capacity building requires an integrated package of activities comprising at least three key elements:

- i. Knowledge-based products;
- ii. Delivery mechanisms;
- iii. Support infrastructure.

HRD programmes which offer these three elements as an integrated package of services, help create opportunities for individuals and enterprises to maximize the performance of personal and organizational investment. The following section provides a brief description of each element.

I. Knowledge-based products

The term "knowledge-based products" encompasses both formal and informal education, training, and other forms of learning experiences. Rather than relying on traditional education and training programmes founded on standardized and structured approaches to knowledge and skill enhancement, the term "products" is used to emphasize the emerging need to disaggregate learning events and experiences, and then to package these "products" into a modular user-friendly and flexible set of activities that better match labour force needs.

Given financial, geographic and time constraints often faced by potential beneficiaries of HRD programmes, types of delivery sites most accessible to beneficiaries inevitably drive the substance and delivery mechanisms of knowledge-based products¹. In this respect, flexible and modular learning experiences play an important role in determining the outcome of HRD programmes.

It is possible to have three different types of knowledge-based products: tailored products; off-the-shelf products; and combinations of tailored and off-the-shelf products. The inputs required to arrive at each of the three types differ.

¹ There are at least five types of delivery sites most often associated with HRD programmes:

- a. formal class room
- b. factory or office
- c. learning centres
- d. home-based learning
- e. field visits.

The selection of delivery sites is determined by constraints to access faced by recipients; type of learning experience sought; and the depth of knowledge required.

- A. **Tailored product** Developing a tailored product requires, at minimum, two basic steps: a needs assessment²; and formulation of the actual product based on the needs assessment and priority areas established by the governments or enterprise managers¹.
- B. **Off-the-shelf products** A wide variety of off-the-shelf products to enhance basic skills and knowledge are readily available, covering most topics. It is important to determine whether the package meets the specific needs of the beneficiaries, to gauge the quality of the package, and to determine whether follow-up support is available through the provider of the package. In this respect, a simple evaluation of the internal HRD needs is required.
- C. **Combining off-the-shelf and tailored products** Given the inherent limitations of an off-the-shelf product, a combination of off-the-shelf and tailored knowledge-based products can be utilized to achieve the desired outcome of a HRD programme. Here again, a simple evaluation of internal HRD needs is required to identify areas where tailored products can best yield results closely linked to the desired outcome.

Independent of the type of knowledge-based product one elects to use, a product must impart or enhance, to varying degrees, four basic attributes:

- a. skills⁴
- b. knowledge³
- c. ability⁶
- d. attitude⁷

Once the type of packaging and substance of the HRD programme is determined, the next step in the process is to understand and select the types of delivery mechanisms most suitable for maximizing the output of knowledge-based products, while effectively reaching the target audience.

² A needs assessment must account for the following activities:

- a. creation of indicators
- b. conducting a survey based on the indicators
- c. collection and compilation of survey data
- d. data analysis and
- e. translating analyzed data into itemized list of HRD needs.

¹ The itemized list of needs identified as a result of the needs assessment must then be transposed against priority sectors or activities identified by a government or enterprise manager. This then can be used as a basis to formulate client- and substance-specific knowledge based products (for example, capacity building in inventory management for rural workers in the frozen food industry).

⁴ The category of skills includes communication, human relations, computation, mechanical, human relations, analysis, synthesis, learning, and skills specific to an occupation.

³ Categories of knowledge include general, scientific (ie. physical, biological and social), technological (ie. physical, biological and social), humanistic, and those specific to an occupation.

⁶ Categories of ability include intelligence, and achievement motivation.

⁷ The category of attitudes includes innovation, scientific-technology attitude, integrity, honesty, reliability, readiness to cooperate with others, and attitudes specific to an occupation.

2. Delivery Mechanisms

The types of delivery mechanisms most appropriate for an HRD programme are often defined by four factors: the delivery site which best matches the needs of beneficiaries; accessibility to hardware and software; know-how associated with different types of delivery mechanisms; and the characteristics of the target recipients. In this respect, there are a number of common delivery mechanisms to choose from to accommodate HRD needs of prospective clients:

- a. lecture and seminars
- b. interactive computers
- c. correspondence courses
- d. video and television
- e. radio
- f. on-the-job-training

An integrated HRD programme would require that delivery of knowledge-based products rely on a number of delivery mechanisms, where one delivery mechanism is treated as a master medium and others used as reinforcing media.⁸

3. Support Infrastructure

The successful delivery and outcome of the knowledge-based products of an HRD programme is directly related to the effectiveness of support infrastructure put into place by a host government or an enterprise. Support infrastructure for HRD programmes must be implemented at two levels: macro-level interventions to be introduced and managed by the public sector, and micro-level infrastructure support programmes implemented at the enterprise level.

⁸ Distance education systems are based on the concept of self-instruction. Within the context of distance education, self-instruction is the process whereby an individual learns without the need for a teacher directly teaching the student. Therefore, the media must facilitate self-instruction. This implies that in order to be able to use books as self-instructional material and learn from them without help, the learner must have previous knowledge of the subject, good reading habits and skills, and be interested and sufficiently motivated. Anyone not able to fulfill these basic conditions is likely to face difficulties with this kind of learning system.

Distance learning is widely thought of as a system which uses media to make education possible despite distance. However, proponents of distance learning have put the delivery system ahead of the educational process such that too much stress is being laid on the media used and not enough on educational criteria. In this respect, distance learning should be viewed as a new way of organizing education. Distance learning, especially in the poorest countries and in rural areas, is closely associated with learning through printed media. While various interactive systems based on multi-media are available in the market today, accessibility has been and will continue to be a problem for most. The issue of accessibility has at least two facets: one of cost, and the other related to the availability of adequate equipment. For the most part, those most in need of education often face the greatest financial restrictions. Secondly, whether distance learning is delivered to prospective students through telephone line, radio wave, satellite or fiber optics, in poorer countries and in rural areas, adequate hardware to translate data and information from these delivery infrastructures is often obsolete or not available. In this respect, both personal and institutional costs associated with an interactive learning experience would have to be pursued on a vision of multi-media rather than reality.

This problem is further aggravated when distance learning is applied to emerging technology and techniques where information and concepts are new to the learner, and access to background in preparation of a learning experience is limited. Nonetheless, the interactive nature of select media-based technologies may help to bridge the gap between benefits of face-to-face teacher-student learning experience versus self-instruction, in more advanced developing countries.

- A. Macro-Level Support: Infrastructure** The causal relationship between the success of government programmes and the existence of a clear policy, regulatory and legal framework is well documented. Examples of most of the relevant support factors for HRD programmes are cited below:
- i. Policy and guidelines, including systems of incentives to encourage and support HRD programmes;
 - ii. Formulation of HRD laws and regulations which help to define the relationship and responsibility between enterprises and their employees;
 - iii. Formulation of linkage and feedback mechanisms between: providers of knowledge-based products; private and institutional beneficiaries; government policy makers;
 - iv. Establishment standards and quality control in line with international norms.
- B. Micro-Level Support Infrastructure** Within a well-defined macro framework, the full impact of an HRD programme can only be realized when a number of institutional- and individual-level support activities are engaged. Examples of such support activities are cited below:
- i. Strengthening individual and institutional capacity for delivery of knowledge-based products;
 - ii. Formulation and implementation of post-service support programmes;
 - iii. Open access to external sources of information on up-to-date HRD activities.

The conceptual framework presented above is not meant to define a guideline for approaching the development of HRD programmes. It is meant to provide a common point of reference within which to address a range of problems that arise in HRD across different nations and cultures. The factors presented here are not exhaustive, but serve to define a minimum requirement for the design and implementation of an HRD programme. Given these factors, we shall now go on to look at more explicit issues facing the proposed UNIDO-UNESCO-University.

III. PRIMARY CHARACTERISTICS AND PROGRAMMING OF CONTRIBUTING AGENCIES

UNIDO, and UNESCO, exhibit distinct characteristics and unique strengths which can be tapped to create a complementary programme to support HRD needs. The objective of this section is to highlight the characteristics of the three contributing agencies which will serve as the basis for re-formulating a proposal for a joint UNIDO-UNESCO-University.

I. UNIDO

Programmes under UNIDO are divided into 12 major areas that define both administrative and substantive responsibilities. Overall, however, special attention will be given to seven priority areas:

- i. Strategies, policies and institution-building for global economic integration
- ii. Africa and least developing countries
- iii. Environment and energy
- iv. Small and medium enterprise: policies and networking
- v. Innovation, productivity and quality for international competitiveness
- vi. Industrial information
- vii. Rural industrial development

These seven thematic areas serve as a foundation for project-specific activities undertaken by the substantive departments within UNIDO.

The heading for UNIDO's 12 Major Programmes are as follows:

Major Programme 100:	Policy Making Organs
Major Programme 200:	General Management
Major Programme 300:	Country Strategies and Programme Development
Major Programme 400:	Mobilization and Management of Financial Resources
Major Programme 500:	Information and Research
Major Programme 600:	Human Resources, Enterprise and Private Sector Development
Major Programme 700:	Industrial Sectors and Environment
Major Programme 800:	Investment and Technology Promotion
Major Programme 900:	Common Programmes
Major Programme 1000:	Operational Support Services
Major Programme 1100:	Joint and Common Services
Major Programme 1200:	Administration

Of the 12 Major Programmes operating under UNIDO, Programmes 600, 700, and 800 represent departments that provide substantive external services as well as generate revenue from their services. In this respect, these three major programme areas are of major interest to the coordinated effort proposed under the UNIDO-UNESCO-University Programme. Therefore, the following sections will highlight activities under these three major programmes.

A. Major Programme 600: Human Resources, Enterprise and Private Sector Development

Builds up the "enabling environment" for industrial development and competitiveness through advisory services on industrial strategies and policies, human resources development, institutional support, private sector development, small and medium enterprise development, and enterprise restructuring.

Programme 610 (Office of the Managing Director): Provides management and direction to ensure coordination and cooperation among the various programme components.

Programme 620 (Human Resources Development): Assists in building up human resources base in recipient countries, particularly among entrepreneurs, managers and technicians. Special attention is given to the needs of women, youths, and minority and marginalized groups

Programme 630 (Enterprise Development and Restructuring): Enhances the economic performance of industrial enterprise through strengthening quality management and standards

Programme 640 (Small and Medium Enterprises): Promotes and develops a dynamic and efficient SME sector through productivity enhancements and competitiveness.

Programme 650 (Industrial Policies and Private Sector Development): Contributes towards a market-based competitive economic system through transparent government policy for enhancing competition, investment and social development.

B. Major Programme 700: Industrial Sectors and Environment

Supports development of specific industrial sectors and promotes environmentally sustainable development through technical cooperation and advisory services.

Programme 710 (Office of the Managing Director): Provides management direction and ensures effective coordination and cooperation among the various components.

Programme 720 (Agro-based Industries): Supports sustainable development of agro-based industry sector through efficient use of natural resources and energy, application of clean and effective technologies and techniques.

Programme 730 (Chemical Industries): Supports sustainable development of chemical industries through reduction of material and energy inputs, and by promoting effective and clean manufacturing processes, quality assurance and maintenance systems.

Programme 740 (Engineering and Metallurgical Industries): Supports the development of engineering and metallurgical industries with particular emphasis on process and product technology and know-how.

Programme 750 (Environment and Energy): Supports the adoption of energy-related policies which help reduce industry demand of non-renewable natural resources, reduce emissions, and reduce discharge of waste and pollutants.

C. Major Programme 800: Investment and Technology Promotion

Supports investment and technology development in developing countries and creates links between industries in developing and developed countries.

Programme 810 (Office of the Managing Director): Provides effective management and direction of activities in the programme.

Programme 820 (Investment Service): Enhances cooperation between industrialization and developing countries, and promotes foreign direct investment.

Programme 830 (Technology Service): Enhances the technological capabilities for industrial development in recipient countries.

Programme 840 (Industrial Cooperation and Consultations): Enhances global and regional industrial cooperation through specialized forward-looking forums and increasingly through consultations to stimulate and support partnerships between developed and developing countries.

2. UNESCO

The theme for the first phase of the execution of UNESCO's Medium-Term Strategy for 1996-2001 submitted to the General Conference for approval is "lifelong education". Within this thematic area, the main concept which UNESCO expects to emphasize is "learning without frontiers".

Given this theme and concept, UNESCO has categorized its activities into four major programme areas and a number of subsidiary programmes targeted towards four priority groups: women; youth; least developed countries; and Africa.⁹ Within this context, UNESCO's overall strategy emphasizes cooperation and joint actions at regional or sub-regional levels, partnerships in education and training, research and the exchange of scientific information, culture and communication. Specific strategies have been devised to respond to needs of countries in economic transition, small island states, and Portuguese-speaking countries of Africa. The following section presents a summary of the four major programmes.

A. Major Programme I: Towards Lifelong Education for All

Major Programme I is structured to promote education for all throughout a person's lifetime. The activities seek to support Member States' endeavors to rethink the nature and purpose of education in the light of worldwide changes. The proposed activities lay emphasis on developing flexible and diversified forms of education and training at all levels, to reach the unreached and include the excluded; that is those who have no access to, or are under-served by, educational opportunities as well as those who are seeking a second-chance opportunity to learn or upgrade skills.

Programme I.1 (Basic Education for All): Provides basic education, especially to girls and women, and disadvantaged groups.

Programme I.2 (Reform of Education in the Perspective of Lifelong Education): Promotes renovation and reform of education at all levels.

B. Major Programme II: Sciences in the Service of Development

Transfer and sharing of scientific and technical knowledge and its application to development by improving the relevance of university education and research through cooperation in collection and dissemination of scientific and technical information.

Programme II.1 (Natural Sciences): Use of renewable energy sources and strengthening of relations between universities, research and industry.

Programme II.2 (Social and Human Sciences): Forum for reflection on the ethical implications of changes occurring in contemporary societies.

Programme II.3 (Environment Science and Sustainable Development): Focuses on climate change, biological diversity and desertification.

Programme II.4 (Social and Human Science and Social Development): Promotes the use of research findings and experience for the management of social transformations, and formulation of development policies.

⁹ Distribution of funds (in terms of direct cost) for the priority groups are as follows

Women	US\$10 million
Youth	US\$9.4 million
LDCs	US\$12.4 million
Africa	US\$15.2 million

C. Major Programme III: Cultural Development (Heritage and Creativity)

The primary objective of Major Programme III is to develop strategies for safeguarding heritage, and to strengthen activities relating to intangible heritage. Emphasis will be placed on improving the status of the creative, while activities in the field of copyright will be carried out in the light of the technological environment.

Programme III.1 (Strategies for Safeguarding the Heritage): Strengthens activities relating to intangible heritage.

Programme III.2 (Artistic Creativity and Cultural Industries): Crafts promotion, books and reading.

D. Major Programme IV: Communication and Information

Aims at the double objective of promoting the free flow of ideas through word and image while contributing to the strengthening of infrastructures and vocational training.

Programme IV.1 (Free Flow of Information): Promotes freedom of the press, media pluralism and independence, and the use of leading-edge technologies.

Programme IV.2 (Capacity-Building in Communication, Information and Infomatics): Development of community-based media to meet the needs of population groups living in the most disadvantaged rural and urban areas.

IV. Comparative Advantages of Contributing Agencies

As evident from Section III, each of the three contributing agencies have on-going a number of complimentary programming activities. In fact, the comparative advantage of each contributing agency is also complementary to existing programmes currently undertaken by these organizations. Referring back to Section II regarding the conceptual framework for HRD programmes, three categories of activities, i.e. knowledge-based products, delivery mechanisms, and support infrastructure, offer a framework within which to review the comparative advantages and complementarity of activities currently being undertaken by the three contributing agencies.

The following section highlights programme-specific activities made available by UNIDO and UNESCO.

I. Knowledge-Based Products

The three contributing agencies have on-going programmes that offers formal and informal learning experiences, as well as standardized education programmes often offered through traditional school environments. The following section will highlight specific programming activities of each of the contributing agencies, particularly UNIDO and UNESCO, where specific knowledge-based products can and are being packaged for their clients.

A. UNIDO

In UNIDO, a number of services to develop knowledge-based products are offered through at least three of its major programmes (Human Resources, Enterprise and Private Sector Development Programme, Industrial Sectors and Environment Programme, and the Investment and Technology Promotion Programme). Specifically, the following programmes offer a range of general and sector-specific knowledge-based products to choose from:

Programme 620:	Human Resources Development
Programme 630:	Enterprise Development and Restructuring
Programme 640:	Small and Medium Enterprises
Programme 720:	Agro-based Industries
Programme 730:	Chemical Industries
Programme 740:	Engineering and Metallurgical Industries
Subprogramme 821:	Investment Promotion Programme
Programme 830	Technology Services

Under these programmes, in-house methodologies are available to conduct needs assessments to determine the type of knowledge-based packages best suitable for a given client base and location. Perhaps more important are the various local capacity-building activities incorporated into projects executed under these programmes. The primary objective of local capacity-building activities or catalytic learning is to enable indigenous institutions to develop skills which allow local professionals to create both off-the-shelf and tailored knowledge-based products to meet specific needs of their client base.

Particular attention should be brought to the fact that UNIDO has taken leadership in providing technical assistance, inclusive of HRD programmes, to client countries in the areas of environment, and energy and industry subsectors, and in the promotion of technology and investment flows.

The niche best filled by UNIDO under these programmes is in the area of vocational/occupational learning experiences. On the other hand, UNESCO is more effective in filling the development of knowledge-based products for secondary and higher education.

B. UNESCO

While UNESCO is involved in providing a wide range of learning experiences, a review of programming activities suggests that its strength lies partially in delivering intervention services at the secondary and higher education levels. This is not to suggest, however, that UNESCO's programming activities neglect vocational and occupational learning experiences. In particular, a range of services to develop knowledge-based products are found in the following subprogrammes¹⁰:

Subprogramme I.1.1:	Expanding access to basic education
Subprogramme I.1.2:	Improving the quality of relevance of basic education
Subprogramme I.2.2:	Reform of education at the secondary level
Subprogramme I.2.3:	Higher education and development
Subprogramme II.1.1:	Teaching, research and cooperation in the basic engineering sciences
Subprogramme II.2.1:	Teaching, research and cooperation in the social and human sciences

Under each subprogramme, UNESCO has defined a number of specific agendas which addresses relevant issues for the development of knowledge-based products. For example, under subprogramme I.2.2 (Reform of education at the secondary level), the primary agenda is to "advance the renovation of structures, content and methods of secondary education", and "to enhance scientific and technological literacy and science education for all".

2. Delivery Mechanisms

Delivery mechanisms provide a means by which to transfer learning experiences to the ultimate beneficiary. As pointed out in Section II, there are a number of ways in which learning experiences are transferred. For many obvious reasons, programmes or subprogrammes must be delivered in one form or another. At the same time, however, improper delivery mechanisms can undercut the substance and undermine the final outcome of learning experiences. Both UNIDO and UNESCO have developed methodologies for identifying the most appropriate form of delivery mechanisms, whether specific to a project or more broadly to accommodate pre-existing socio-economic, cultural and geographic conditions.

A. UNIDO

While a number of programmes within UNIDO assist clients to design appropriate delivery mechanisms, the development of client-specific delivery mechanisms to circumvent pre-existing constraints facing ultimate beneficiaries of learning experiences is tackled most effectively by the Human Resources, Enterprise and Private Sector Development Programme (Major Programme 600). In particular, the following programmes provide tangible assistance to public and private institutions in the design and implementation of various delivery mechanisms:

Programme 620:	Human Resources Development
Programme 630:	Enterprise Development and Restructuring
Programme 640:	Small and Medium Enterprises
Subprogramme 821:	Investment promotion programme
Subprogramme 823:	Feasibility studies
Subprogramme 831:	Technology Development

These programmes maximize the use of flexible delivery mechanisms based on computer-aided decision making systems, video and television, and interactive computer programs. Electronics-based delivery mechanisms are not the only form utilized by these programmes. In fact, more conventional mechanisms such

¹⁰ The UNESCO Institute for Education Programme I.2 (Reform of Education in the Perspective of Lifelong Education) is an example in addition to these subprogrammes

as lectures/seminars delivered partially through distance learning programmes combined with electronic forms of delivery mechanisms, have helped to develop flexible access for beneficiaries otherwise not able to realize their skills and knowledge enhancement objectives.

B. UNESCO

As would be expected, various delivery mechanisms introduced by UNESCO are based extensively on effectively reaching those in need of basic and continuing education. In addition, much focus is placed on improving the environment in which knowledge-based products are delivered. In the same way that distance learning mechanisms are often used by UNIDO, UNESCO has effectively employed open learning systems. The following subprogrammes represent a number of mechanisms used by UNESCO¹¹:

Subprogramme I.1.2:	Improving the quality of relevance of basic education
Subprogramme I.2.1:	Education for the 21st Century
Subprogramme I.2.2:	Reform of education at the secondary level
Subprogramme I.2.3:	Higher education and development
Subprogramme I.2.4:	Reform and reconstruction of education systems
Subprogramme II.2.1:	Teaching, research and cooperation in the social and human science
Subprogramme IV.2.4:	New applications of information and communications technologies

Under the heading of these subprogrammes, a number of specific services are provided by UNESCO to meet the needs of its clients. Examples of such activities include improving the quality of learning environments for children, youth and adults (Subprogramme I.1.2), and contributing to the development of the information and documentation networks in the social sciences (Subprogramme II.2.1).

3. Support Infrastructure

As outlined in Section II, two types of support infrastructure are required to help public and private institutions realize their human resources development objectives, i.e. macro-level support infrastructure, and micro-level support infrastructure. Both UNIDO and UNESCO offer programmes to assist public and private institutions to formulate and implement HRD support programmes. The following section highlights a number of prominent programmes of interest to prospective beneficiaries.

A. UNIDO

UNIDO programmes are designed with a view to the fact that the success of a programme is driven by the policy environment within which it operates. A large number of programmes offered by UNIDO have projects that emphasize feedback and monitoring/evaluation activities as well as the building up of the macro-level support infrastructure. The following programmes provide specific assistance to its clients in this area:

Programme 620:	Human Resources Development
Programme 630:	Enterprise Development and Restructuring
Programme 640:	Small and Medium Enterprises
Programme 650:	Industrial Policies and Private Sector Development
Subprogramme 831:	Technology Development
Subprogramme 832:	Technology Acquisition
Programme 840:	Industrial Cooperation and Consultations

Services offered under the Major Programme 600, place particular emphasis on institutional strengthening.

¹¹ The UNESCO Institute for Education is also a source of significant examples.

development of HRD policy and strategies, monitoring and evaluation Programmes, formulation of enabling policy, industry cooperation/coordination, government industrial policy making as well as issue-specific policy assistance such as the formulation of technology policy.

B. UNESCO

UNESCO provides a range of services to assist clients in formulating macro- and micro-level support infrastructures. These support infrastructures, however, tend to focus more on education policies and institutional strengthening directly related to basic education Programmes. While not all UNESCO Programmes relevant to support infrastructures are specifically targeted at basic education Programmes, UNESCO has a clear comparative advantage as providers of such services. Some examples are highlighted below:

Subprogramme I.2.1:	Education for the 21st Century
Subprogramme I.2.4:	Reform and reconstruction of education systems
Subprogramme II.3.1:	Coordination and promotion of interdisciplinary and inter-agency cooperation
Subprogramme II.4.1:	Social transformations and development
Subprogramme II.4.2:	Young people and social development
Subprogramme IV.1.2:	Access to information and technologies

"Environment and Population Education and Information for Development" is an example of a transdisciplinary project. The UNESCO International Bureau of Education and the UNESCO International Institute for Education Planning are also involved in such projects.

Subprogrammes covered by UNESCO address such issues as analysis of major trends and policy issues in education, foster sharing of experience on education policy and innovation, and contribute to the reform and reconstruction of education system, as well as fostering policy-relevant research in areas of social transformation and development.

4. Comparative Activities

The issue areas are categorized into three basic groups, which are then further refined into a number of task oriented sub-components. The matrix presented below was developed to highlight the fundamental strengths of each contributing agency in providing services relevant to a coordinated HRD programme.

COMPARATIVE ADVANTAGES OFFERED BY CONTRIBUTING AGENCIES

Knowledge-based Products	UNIDO	UNESCO	UNIVERSITY
Secondary Education		X	X
Higher Education		X	X
Vocational/Occupational learning experience	X ¹¹	X	X
Delivery Mechanisms			
Secondary Education		X	X
Higher Education		X	X
Vocational/Occupational learning experience	X	X	X
Linkage Mechanisms			
Higher Education - Vocational/Occupational learning experience			X
Vocational/Occupational learning experience - Industry	X		X
Support Infrastructure			
Feedback	X		X
Monitoring/Evaluation	X	X	X
Policy/Strategies	X	X	X
Coordination	X		

¹¹ As a technical assistance agency, UNIDO is particularly strong in the area of technology transfer and technology-labour dynamics. In particular, UNIDO assists clients in increasing their opportunities for access to technologies needed for industry and social development, and reducing constraints to the technology transfer process. Technical assistance provided by UNIDO helps to enhance the efficiency in the selection, acquisition, use and assimilation of technology, and to improve efforts to integrate technology imports with domestic technology and investment promotion activities.

UNIDO's technical assistance in this area is often delivered in the form of institutional strengthening, training of trainers, access to technologies, and adaptation of appropriate technology.

V. GRADUATE RESOURCES INTEGRATION PROGRAMME (GRIP): PROGRAMME FORMULATION

1. Background

In most instances, evidence exists to suggest that there is an overabundance of institutions of higher education in many countries which offer technology-based education. Perhaps what is more evident is the critical misalignment that seems to exist between the types of curricula and skill endowments of graduates from engineering schools against the immediate skill needs of industry.

One factor contributing to the creation of a gap between education and employment has been the misalignment or inadequate linkage between the economic development objectives of the country and education policy that help to match labour skill needs of industry. Without such a linkage, realizing capital investments that have the greatest impact on meeting the developmental objectives of the government becomes increasingly remote. The obvious impact of this misalignment, as evident in many country, is the low transfer rate of graduates to relevant employment opportunities.

This particular problem is not unique, however. In fact, most countries, both developing and developed, continue to be challenged with the difficulty of linking supply elements of education, health and skills planning, and demand elements of employment and changing labour market conditions. Thus, the proposed joint venture between UNIDO-UNESCO-University should draw attention to the need to strengthen and establish effective linkage mechanisms between labour output of institutes of higher education and other learning centres to the skill needs of industry, particularly in technology-intensive industries.

As evident from previous sections of this report, the comparative advantages of UNIDO and UNESCO do not lie in the creation and administration of institutes of formal education. The real strength of UNIDO and UNESCO lies in the fact that both have established methodologies and systems for creating and delivering learning experiences within a supportive policy environment for sustainable HRD. While it may be desirable to establish a formal educational setting to promote and deliver learning experiences in the area of emerging technology and techniques, the proposed tri-lateral relationship between UNIDO-UNESCO-University may not be the most appropriate forum for such an activity. Having said that, independent of whether a formal educational institution is established or not, a need will continue to exist for translating basic skills and knowledge acquired in a formal educational setting into productive and gainful employment. The proposal presented in this document explores prospects for devising mechanisms to help students translate basic skills and knowledge acquired in a formal educational setting into on-the-job skills and discipline.

2. Basic Issues

A number of factors can be attributed to difficulties in integrating graduates from institutes of secondary and higher education as productive participants in industry. An example of several key factors are presented below:

- A. **Supply-Demand Gap:** It is common to find a mis-match between skills of students graduating from institutes of secondary and higher education, against skill needs of industry. This gap is further aggravated as the pace of technological renewal accelerates.
- B. **Geographic constraints:** The lack of worker mobility¹⁾, and industry and company relocation

¹⁾ The lack of worker mobility can be attributed to a number of factors. Perhaps the most critical are those highlighted below:

- a. difficulties in accessing transportation;
- b. family constraints, such as child rearing, care for the elderly, and other family obligations;
- c. physical distance between the worker's place of residence and location of employment;
- d. cost of transportation; and
- e. socio-cultural barriers.

centred around geographic constraints¹⁴.

- C. **Access to information:** Lack of readily available information on employment opportunities¹⁵
- D. **Employment opportunities:** Lack of locally available job opportunities, independent of skills¹⁶
- E. **Motivation and attitudes:** Lack of motivation or negative attitudes attributed to individual and job market uncertainties¹⁷.

Relying on the conceptual framework set out in Section II as a basis for analysis, particularly in the context of addressing the basic issues highlighted above, the comparative advantages offered by the three contributing agencies should serve as a platform for formulating a joint HRD programme to link the employment needs of school graduates with the skill requirements of industry.

3. Graduate Resources Integration Programme (GRIP): The Framework of the Programme and Its Components

As suggested earlier, rather than creating yet another institution for higher education, a joint programme between UNIDO-UNESCO-University should bring attention to formulating methods for closing the supply-demand gap between human resources output of education institutions and input requirements of industry. In this respect, the primary objective of GRIP is to develop methods of linking supply-demand factors associated with HRD, to formulate knowledge-based products that effectively serve as the cornerstone of skill and knowledge most desired by industry, to develop an appropriate delivery mechanism to accommodate constraints faced by the students in accessing various learning experiences, and finally to create a mechanism for implementing policies that best support the proposed programmes.

The primary thrust of the proposed GRIP, is to integrate postgraduates from secondary and higher education institutes as productive participants in industry. To realize this objective, GRIP envisions three distinct, but interrelated activities. These three activities are presented below:

¹⁴ Industrial and company relocation occurs for various reasons. Several of the most common relocation factors are highlighted below:

- a. corporate downsizing in response to market and competitive conditions;
- b. change in government regulations, covering issues such as taxes, labour and unions, pollution, etc.;
- c. change in transportation patterns or costs relevant to freight and movement of goods;
- d. change in availability and cost of input resources;
- e. change in labour costs;
- f. change in prevailing demand patterns; and
- g. natural disaster.

¹⁵ Many countries lack an adequate information network between job opportunities available in industry and those seeking jobs. The lack of an established medium for disbursement of such information whether through electronic medium or hard-copy, and accessibility to this type of information by those most in need, have been the central challenge.

¹⁶ In the past several years when the global economy has faced a slowdown in market activities, the disparity between population concentration and job opportunity, independent of skill level, has become increasingly acute. In this respect, manpower planning and other labour force projections have failed to yield the anticipated outcome that these programmes originally expected.

¹⁷ Lack of intellectual and emotional preparation to join the active labour force, the lack of achievement motivation, integrity and readiness often dampens drive among prospective graduates from institutes of higher education to actively seek out employment opportunities. Furthermore whether caused by internal or external factors, uncertainties in the job market often lead prospective workers to seek job security over employment which better matches skill and knowledge representative of the individual's educational background.

A. Industry-University Linkage

- a. Industry-University feedback for curriculum development
- b. The creation of an "Industry-Job Core":
 - i. An intern/mentoring programme for pre-graduating students in industry during the last year of study; and
 - ii. A "Tuition-Employment Swap" programme.

B. Employment Credits: Formulation of policy to encourage direct industry participation in employment programmes through the use of financial and non-financial incentives.

C. Institutional Strengthening: Development and strengthening of local career development centres through career planning and counselling, and the development of a computerized job placement network ("Jobnet").

4. Implementation of GRIP: Roles and Responsibilities of UNIDO-UNESCO-University

The objective of this section is to provide descriptions of ways in which GRIP can be implemented based on the comparative advantage of the three contributing agencies. The descriptions and approaches to implementation will be addressed in the context of the conceptual framework devised in Section II.

Before substantive activities can be formulated to develop methods for creating and strengthening a university-industry linkage, a consortium of university and industry leaders must be formed to help define objectives, provide leadership and direction, and serve in an advisory capacity to GRIP. Members of the proposed Board can be elected based on priority areas defined by the government or industry. In this particular case, programme emphasis is placed on emerging technologies and innovation techniques. Likewise, enterprise and university leaders in this area would be asked to participate as Board members¹⁴.

A policy framework to encourage participation by both industry and universities will be covered in a later section.

A. Industry-University Linkage

It is evident from history that an industry-university linkage based on standardized and traditional university curriculum is not an effective means of responding to the needs of industry. While other factors, such as the existence of an enabling policy environment for industry-university linkage must be in place, empowering educational institutions and industry with the capacity to formulate tailored modular learning experiences to improve the supply-demand relationship of HRD seem to be fundamental to the solution of the problem. This is particularly true if we are to realign industrial skills of graduates, especially in areas related to emerging technology and innovation techniques. To realize such a learning system, the first order of business is to formulate a industry-university feedback, monitoring and evaluation system.

a. Industry-University feedback for curriculum development

Perhaps the most critical step in formulating an effective feedback, monitoring and evaluation system is to conduct a needs assessment to gauge the waterfront of issues to be addressed. Such a needs assessment could

¹⁴ Membership to the Board should be limited to no more than 10. At the enterprise level, proposed members should be identified and nominated through an election process within various associations and chambers relevant to the priority area. As for universities, a similar process should be undertaken amongst members of university faculties. All posts should have a defined duration and should also be based on a system of rotation.

be implemented based on a comprehensive survey that employs HRD indicators tailored to meet the demands of the client. These types of indicators have been developed by the HRD branch in UNIDO.

The GRIP Board would be tasked with the responsibility for coordinating and undertaking such a survey¹⁷. The results of the survey would then serve as a foundation for re-formulating curriculum at the secondary level and institutes of higher education. Subprogrammes 1.1.1 (Expanding access to basic education), 1.1.2 (Improving the quality of relevance of basic education), 1.2.2 (Reform of education at the secondary level), 1.2.3 (Higher education and development), and UNESCO Institute for Education under Programme 1.2 can serve as sources of technical assistance to help re-define the proposed learning system. While meeting the skill demands of industry, the underlining objective of the new curriculum is to strengthen and expand the knowledge base of individuals (including general, scientific, technological, humanistic, and occupation-specific) so that over time, the versatility of workers in adjusting to new market conditions is increased.

Curriculum should provide a strong theoretical backbone combined with a practical application component. The delivery associated with such a curriculum should be offered as a modular learning experience based on different types of technology, and within the context of the evolutionary cycle of a given technology. In order to enhance the flexibility of learning systems available to students, the learning experience should maximize the use of interactive distance learning techniques.

b. "Industry-Job Core"

The primary objective of the "Industry-Job Core" programme is to impart practical "real world" work experience to students before studies at secondary and higher education levels are completed, through an intern/mentoring programme¹⁸. Secondly, an "employment-tuition swap" would assist students to meet the financial requirements for continuing and completing higher education.

The proposed "Industry-Job Core" programme would require all students to work outside an educational institution for one year, preferably in an office or a factory setting, in the field of their study. Here the objectives are two-fold. First, on-site intern/mentoring would provide opportunities for students to put skills and knowledge built up over the previous two or three years into practice. In some cases, students may not realize a direct correlation between their studies and skill needs in a work environment. In such cases, the student has one or two additional years to reconsider and refine skills needed to accommodate the demands of the workplace. During the proposed one-year intern/mentoring period, students would also be responsible for continuing their formal education through various forms of distance learning systems to be formulated by the Board¹⁹.

Job placement would take place through a centralized programme using a computerized search programme ("Jobnet" - to be discussed in a later section). Job openings would be identified through a listing service to be formed through data available through members of chambers of commerce, associations, and other pre-existing sources of information. While students would not be paid a salary for the one year of work in the intern/mentoring period, the sponsoring enterprise would be

¹⁷ The use of external consultants may be required for such an undertaking.

¹⁸ Most vocational and occupational training programmes provide services to students after formal studies have been completed. This form of intervention leaves no room for students to reconsider or reflect on what they have learned in a formal educational setting. For this reason, earlier intervention is suggested to break the years of study by introducing an intern/mentoring programme after the second or third year of study.

¹⁹ During this phase of the education process, video, television, computers and multi-media, as well as more traditional forms of correspondence learning systems would be employed to supplement real world work experience with fundamental skills and know-how.

responsible for covering the cost of the intern's living expenses²². The goal of this type of programme is to take a step towards translating newly acquired knowledge imparted to students through a formal educational environment into applicable skills.

The effective implementation of such a programme can be realized through assistance from UNIDO Programmes 620 (Human Resources Development), 630 (Enterprise Development and Restructuring), 740 (Engineering and Metallurgical Industries), and Subprogramme 831 (Technology Development). From UNESCO, UNISPAR (University-Industry-Science Partnership) would be particularly useful in assisting the Board to formulate such a programme²³.

The second objective of this component of the programme is to develop a "tuition-employment swap". In many countries, financial constraint is a major deterrent for young students hoping to pursue higher education. To respond to this problem, the Board in conjunction with UNIDO and UNESCO, would assist in creating a fund to assist students to meet those costs.

Financing would come from two primary sources: The UNIDO-UNESCO-University endowment; and sponsorship from local and international enterprises, as well as government and non-governmental organizations. The fund would be used to offset tuition costs of students in the programme. In return for the contribution, sponsors have an opportunity to select graduates to work in the sponsoring organization for a pre-determined period with only cost-of-living expenses as salary. This can be combined with the "Industry-Job Core" programme where a student can apply for both intern/mentoring and "tuition-employment swap" so that students who intern for an enterprise after the second and third year of study can be re-employed by the same enterprise after the fourth year of formal studies, while having the sponsoring enterprise cover costs associated with basic tuition.

Matching students and enterprises should be based on a standardized process. Students who perform well in select education programmes have the first choice of enterprises for the "tuition-employment swap". Similarly, the level of contribution made by enterprises should also determine the order in which managers are allowed to select students whom they prefer to sponsor²⁴.

A number of national programmes to provide financing for student tuition have been instituted in the past. However, national programmes tended to be less flexible in meeting the needs of students and financial constraints associated with their education. Taking into account the types of modular learning experiences proposed under this programme, a flexible payment scheme that allows students and enterprises to dictate the decision-making process is likely to be more desirable for both parties

²² For larger enterprises, relying on company dormitories and canteens plus basic stipends may be recommended.

²³ Another issue to add here is the creation of a student-teacher evaluation structure whereby students returning from one year of work are required to evaluate professors who are central to their studies. The formalized evaluation system would gauge the relevance and usefulness of the learning experience imparted by professors, as well as to provide insights into types of change required in the curriculum to accommodate changing demands of the market place. The evaluation and substantive adjustments made by professors to accommodate recommendations of students would serve as an input into the salary review, promotion and tenure review of professors. While this form of professor evaluation may place undue pressure on professors to move away from discussions of philosophical and theoretical issues, and to limit educational material to more practical matters, the proposed teacher evaluation process is merely one way of improving the dynamics of a static learning environment to become more responsive to market demands.

²⁴ The selection order should be based on some type of ratio between contribution and corporate revenue. This would give equal opportunity for small and medium firms to compete with larger firms for top students.

B. Employment Credit

The primary objective of the employment credit programme is to formulate policy to encourage direct industry participation in employment programmes through the use of financial and non-financial incentives. The employment credit would allow enterprises participating in both the "Industry-Job Core" and "Tuition-Employment Swap" to enjoy financial and non-financial incentives, such as various forms of tax deductions, training credits²⁾, adjustments in insurance payments, and the like.

The policy framework would need to be nationwide, and cover all enterprises, large and small, that participate in the programme. UNIDO's Major Programme 600 (Human Resources, Enterprise and Private Sector Development), particularly Programmes 620 (Human Resources Development), and 650 (Industrial Policies and Private Sector Development) can offer the Board in-house capacity to formulate and implement such a policy.

C. Institutional Strengthening

While the GRIP Board is tasked with the responsibility of providing leadership and direction to the proposed programme, a need exists to create various dissemination centres where the above activities can be coordinated and administered. In addition to coordinating the proposed programmes, other activities can be centrally coordinated through GRIP Centres. For example, services offered at a GRIP Centre would include career planning and counselling, and the development of a computerized job placement network - "Jobnet".

It is inconceivable that all students and graduates of secondary and higher education in a given location could be covered under a GRIP. Similarly, not all enterprises are likely to participate in a GRIP, even if attractive financial and non-financial incentives are offered. In this respect, a need exists to develop other support mechanisms to create job opportunities for those not covered under a GRIP.

To realize such an objective, an institutional strengthening programme should be introduced to enable GRIP Centres to either coordinate and expand existing job placement services or to develop new services based on interactive computer media accessible through INTERNET. Specifically, UNIDO projects under Major Programmes 600 (Human Resources, Enterprise and Private Sector Development) and 800 (Investment and Technology Promotion) can utilize its in-house experts to offer technical assistance for the development of such an information network. In addition, UNESCO projects under Major Programme IV (Communication and Information), particularly Programmes IV.1 (Free flow of information) and Programme IV.2 (Capacity-building in communication, information and infomatics) can further enhance local capacity to help deliver information and counselling services to students through GRIP Centres.

While the cost of setting up and administering the "Jobnet" would originate from the UNIDO-UNESCO-University, the operating budget would be generated through a subscription fee from enterprises interested in listing job openings on the "Jobnet".

Other institutional strengthening activities relevant to the success of the proposed programmes are as follows:

- a. Training and re-training of teachers to meet new demands of secondary and higher education;
- b. Strengthening of accreditation schemes through the incorporation of international norms;
- c. Redefining and strengthening curriculum linkage mechanisms between secondary and higher education; and
- d. Creation and strengthening of intermediate training and skill enhancement programmes for first-time and re-entry workers.

These issues should be handled as specific projects organized and implemented by the various GRIP centres.

²⁾ Training credits would be associated with either deduction of training expenses from corporate tax, or direct discount from training costs for enterprises participating in the programme.

VI. Concluding Comments

Learning is a dynamic process. Likewise, a learning experience should not end with formal education, but should continue throughout one's life. In this respect, a modular learning experience accessible through flexible delivery mechanisms creates opportunities for continuous learning to be realized. Given a supportive enabling environment for HRD, flexible learning experiences can be utilized to supplement as well as to complement existing knowledge and skill bases to create opportunities to advance personal and socio-economic growth objectives. This is particularly true in the area of emerging technologies and innovation techniques.

The objective of this paper has been to highlight ways in which to assist prospective clients to realize the linkage between skills and knowledge developed in an educational setting with specific occupational skills demanded by industry. Methods of industry-university linkage, the financing of learning experiences, the development of appropriate knowledge-based products, the creation of modular learning experiences, and defining support infrastructures for HRD were explored to promote the creation of a sustainable and dynamic learning environment that links the needs of industry to the human resources capacity of graduates from institutes of higher education.