

# **HIGHER EDUCATION - INDUSTRY RESOURCE INTEGRATION CENTER**

## **Towards solving existing Industrial Problems**

Conference on Launching a Program to Transforming University-Industry-Government  
Relations in Ethiopia

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## **Abstract**

*This paper depicts a short history of the Ethiopian industries and deals with the problems and constraints that these industries are facing in this unprecedented competitive world. Furthermore the missing link between higher institutions and industries is discussed under the light of international experience, Addis Ababa University-Ministry of Industry Cooperation program and Technology Faculty Industry Linkage Unite.*

*The paper uses the concept of triple helix and proposes the establishment of **Higher Education Institutions-Industry Resource Integration Center** as a way foreword to solving the problems that the Ethiopian industries are facing.*

## **1. Introduction**

The central economic difference that distinguishes the 21st century man from that of the preceding ages lies in the capacity to produce goods and services. If the technological capacity of a country is to be assessed, a much greater role has to be assigned to the means of the practice needed for translating the general concept of technology as “capability” into actual “capacity” to produce goods.

There are basically two schools of thought with regard to the technological gap between developing and developed countries. One school of thought believes that, the gap is very large and is growing every year. At the other extreme is the views of the second school of thought that however large the gap may be, with recent technological advancements, the bases are being built up for narrowing it rapidly.

Those who have the second view, generally maintain that the task is to pursue the building up of national capacity, so that maximum advantage may be taken of all available technologies, wherever they have been developed, and to embody them in the instruments of production and in the labor force in order to achieve an accelerated rise in productivity. They urge a rapid expansion of output of producer goods, training of technological personnel and promotion of design and engineering capabilities, so as to achieve as quickly as possible the objective of much greater technological and economic development. To this effect, this paper proposes the establishment of Higher Education-Industry Resource Integration Center to enhance the acceleration of industrial development.

If rapid economic development is to be achieved, it is essential to transfer and make use of emerging technologies. The concept of technology transfer is the purposive movement of established technology in one context when implemented in a different cultural, economical, and technological context. A technology is said to be transferred when the recipient understands and knows the technology deep enough to use it, adapt it, modify it or adjust it until it begins to spread within the recipient’s economy<sup>1</sup>.

However, the transferred technology may entail non optimal use of natural resources, which may have its root in the wrong definition of raw materials for the technologies conveyed. It is not always possible to get the appropriate technology with all the necessary criteria fulfilled.

Technological information about the source, terms, and conditions associated with acquisition; the cost of machines and life time; the skill, raw materials and maintenance requirements, and so forth are important in order to select the right one among alternative technologies. Unfortunately, people who make decisions on technology selection are usually misinformed. As a result people tend to rely on technologies with which they are familiar or which are easily accessible, even if more efficient or cheaper alternatives are available.

An important remedy with this respect would be the introduction of triple helix: the linkage between government, university and industry. In the triple helix “technological

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<sup>1</sup> Charles H. Smith, III “*Japanese Technology Transfer to Brazil*” UMI Research press, Michigan, 1981

facilitators” would be identified. These are people in the higher education and research institutions, who because of their intellectual capabilities, investigative zeal and contacts with the centers of relevant technological developments and industries, become vital sources of technical information. The “facilitators” combat the calm acceptance of advertiser’s claims and promote a healthy skepticism of current claimed advances and alert to the changes of being overwhelmed by a rapidly changing technology. The “facilitators” will also have the responsibility of ensuring that the transferred technology entails optional use of natural resources in the country, and adapting the imported technology so that it becomes compatible to the domestic market and should have a comparative advantage.

Ethiopia’s comparative advantage today lies in its natural endowment, mainly agriculture and cheap trainable unskilled labor force. However, given the *low level of labor productivity* and the traditionally nature of agriculture even exploiting its static comparative advantage *cannot be relied on for long*. *Developing dynamic comparative advantage primarily requires developing technologically leading industries, which could create positive externalities and spill over effect for other industries.*

## **2. Ethiopian Industries**

The history of industrial enterprises in Ethiopia is a very short one compared to its early civilization and independence which dates back over three thousand years. It was during Emperor Menilik’s reign that modernization of the country started. The establishment of the Bank of Abyssinia, modern education, hospitals and the appearances of the first bicycles, sewing machines and shoes were during his reign. The only railway transport, the Djibouti-Addis railway, the first notable infrastructure, which linked interior Ethiopia to the outside world, was constructed by 1917.

Until the 1939-45 war, Ethiopia remained largely insulated from the influences of the world market. Italy had colonized Eritrea in 1896 and during the next forty-five years built up a network of trade and some small-scale production in the area. Yet Eritrea was only a small part of Ethiopia and remained isolated physically, politically and economically from the rest of the Ethiopian Empire. Such relations as existed with the world markets took the form of a division of labor according to which Ethiopia exported a few primary products (almost entirely coffee and animal skins) and imported some manufactured goods. Nevertheless, capital accumulation and participation in the international division of labor remained insignificant.

While Ethiopia’s topographical features played an important part in the economy’s historical isolation from the world market, the country’s inaccessibility by land, the immobility of labor for both geographical and social reasons were also factors explaining why colonial powers did not expand their interests in Ethiopia. Although there were some military expenditure and infrastructure investments during the Italian occupation of Ethiopia (1936-41), the insulation of Ethiopia did not change significantly until the 1940s. The principal reason for this change was that, owing to various mainly non-economic considerations, the United States began to take an increasing interest in Ethiopia’s strategic importance.

During the reign of Emperor Haile Selassie modern schools and universities were opened; roads were built and a few small enterprises mainly foreign-owned and owner managed appeared. They were traditional industries of food processing, beverage, tobacco, and sugar; leather shoes and woodwork; cement and foundry; textile, soap, chemicals, paper and printing presses. The account of the evolution of government policy towards foreign investment in particular and the transfer of technology in general over the year 1950-74 could best be divided into two periods: 1950-59 and 1960-74. The former period was characterized largely by piecemeal changes in Ethiopian policy in response to specific circumstances whereas in the latter period there was a gradual attempt to integrate policy with development planning.

After the fall of Emperor Haile Selassie much has been tried to develop the industrial sector. The ten-year Perspective Plan, 1984/85 - 1993/94, was the first long-term plan to be introduced since the early 1970's, when scientific socialism was adopted as a guiding ideology of the revolution. The Plan had been launched with a view to bring about rapid economic and social change and to lay the ground for socialist economic reconstruction. In the centrally planned economy all private industries were nationalized and were put under ten corporations of the Ministry of Industry.

With the end of the civil war in 1991 and the take-over of power by the Ethiopian People's Revolutionary Democratic Front (EPRDF), the main preoccupations of the Transitional Government were security concerns and the quest for relative political stability. A process of rehabilitating the economy was soon initiated. Essentially, the objective of the program was to utilize emergency assistance to overcome the devastating effects of decades of war and to recommence economic activity. Crucially, however, the government recognized the need for a more coherent economic strategy to correct entrenched macroeconomic imbalances<sup>2</sup>. This culminated in the New Economic Policy (NEP), which was unveiled in late-1991. The emphasis was to dismantle the enormous state intervention and to limit the role of the state in economic activity. The systematic reduction in the role of the public sector in productive activities was to be undertaken in favor of the expansion and deepening of the private industrial sector.

Because of lack of technological capability, *most firms are inefficient*. Furthermore their *productivity and profitability has been declining for long*. Thus the firms must update their technology improve their managerial and labor skills significantly improve their technical know how and enhance marketing capabilities so as to move to a high productivity and efficiency frontier.

These industries that have come to existence through the century, however small and technically backward, they have trained industrial personnel, disseminated the industrial culture and are stimulus to the development of heavy industries. These are then the heritage of the past and the springboard for the future.

## 2.1. Problems and Constraints in Industries

The problem analysis in figure 1 summarizes the problems and constraints of Ethiopian industries<sup>3</sup>. The decisions with respect to the types and capacities of industries have, to a large extent, disregarded the market potentials of the products to be manufactured<sup>4</sup>. As most industries were aimed at producing consumer goods that were imported, they were consequently directed to urban centers, while the majority of the population lives in the rural areas. Such policy contributed to forcing most of the industries to operate at a very low level of their capacity since, after the rapid growth of the early stages, they were not able to extend their market to the rural areas. The other causes of capacity under-utilization include poor design of industrial plants, inadequacy of skilled manpower and qualified managers, shortage of inputs, poor physical and institutional infrastructures, etc.

Poor maintenance is the result of insufficient planning in the procurement of spare parts and replacement components. Generally, when foreign companies provide some maintenance services, its cost is such that it undermines the competitiveness of the industries concerned.

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<sup>2</sup> "Basic Principle and Practices in Industrial Policy Formulation and Plan Preparation in the Eastern and Southern Africa Subregion" ECA Subregional Workshop, Djibouti, 1991

<sup>3</sup> Daniel Kitaw "Objective Oriented Problem Solving - A case study: Mugher Cement Factory" Journal of EAEA.Vol 12,1995

<sup>4</sup> Contractor Faroke J. e Lorange Peter "La cooperazione tra imprese: joint ventures, alleanze tecnologiche ed altre forme di collaborazione per I mercati internazionali" Etas libri, Milano, 1990

The management of the industrial enterprises has been characterized, in most cases, by insufficient planning with respect to raw materials supply, marketing, optimum production and manpower utilization. Such a situation generally resulted in financially inefficient enterprises which, rather than generating surpluses, constituted a financial burden for the economy as a whole.

High cost of production is another major characteristic of the existing industries. High costs of investments, due mostly to lack of proper feasibility studies, excessive use of expensive expatriate skills, over-supply of equipment (in some factories) and wrong technological choice have resulted in a very low productivity of the capital in the manufacturing sector.

The importance of programming or planning manpower requirements for industrial development in the country is twofold. On the one hand, success in industrial development depends in part on the availability of skills, and it is the task of the planners to ensure that skills are available at the appropriate moment. The productivity of plants and equipment is low when the managers and workers handling them are of low capability. Domestic investment may become a burden on communities already poor, and foreign investors may be deterred when no skilled manpower can be recruited or trained.

Three major constraints seem to emerge with regards to higher education and industry linkage, needs and capability assessment and co-ordination of manufacturing industries.

**Constraint C.1** Many higher education institutions, research institutions and industries are working in isolation and their efforts fail to result in improved tools, equipment and services reaching the community in volumes, which would make a real impact on productivity.

**Constraint C.2** A critical misalignment exists between the research output from research institute, the type of curricula and skill endowments of graduates from universities against the immediate skill needs of industry. This may be due to the information gap between the needs of the industrial sector and the resources available at the higher education and research institutions and the inadequate linkage between the economic development objectives of the country and the education policy that helps to match the needs of industry.

**Constraint C.3** Most enterprises in Ethiopia like Kotebe Metal Tool Factory and the Akaki Spare Parts factory are operating at less than 25% of capacity while complaining that competition from imported tools is robbing them of their market. The causes of capacity under-utilization may include poor design of industrial plants, inadequacy of skilled manpower and qualified managers, shortage of inputs, poor physical and institutional infrastructures, etc.

### **3. Higher Education Institutions**

The main aim of higher education institutions is to train mature citizens and carryout research and consultancy activities to make significant impacts in the country's development in various sectors of the economy. To this effect the higher education institutions have been imparting fundamental education to students and carrying out research activities in their faculties and institutions.

If the available technology and the available skills are incompatible, either the technology needs to be adapted or the skills improved. Training does the latter; for instance, it makes it possible for people to use, repair and maintain machinery so far unknown or unfamiliar to them. Training can be imparted in formal institutions or on the job; its content and duration vary depending on the nature of the job and the complexity of the technology involved. Experience suggests that there is a trend towards on-the-job and tailor-made training and away from formal and general training. Moreover, it has been found that training is more effective if it is planned and organized with the active involvement of those to be

trained. A good example is the National Cleaner Industrial Production Project of Ethiopia (NACIPPE) in which the Chemical Society of Ethiopia was involved in the training of industry employees in cleaner production. At the end of their training, the employees came up with a number of projects, some of which were implemented by the industries concerned with substantial financial gains in some instances in addition to having trained employees.

Training can help managers to appraise alternatives and choose more appropriate technologies to use installed capacity more efficiently, to be better supervisors, etc. At different levels, training may enable workers to contribute to improving product quality, to adaptation of technologies, and to innovation.

Technology adaptation and the generation of new technologies require research and development, and more broadly, an environment in which R and D have a chance of being effective. Where urgent national problems have to be solved, the direction of R and D efforts should be determined by national science and technology policies whose priorities are compatible with available skills and financial resources and have been shown to be valid in the light of what is being done elsewhere.

Many of the Universities with their teaching and research resources available in the Faculties, Schools and Institutes carry out teaching and research activities. Nearly all faculties in the Addis Ababa University have started post-graduate studies to satisfy the manpower requirement of the country, especially for the newly emerging regional universities.

However, in most of the faculties and research institutes, problems of research staff development, financial constraints, adequate selection of relevant research areas and proper research facilities including infrastructure, equipment and supplies are evident. As a result, the research activities carried out are not to the university's satisfaction both in quantity as well as quality. The over crowdedness, impoverishment, dilapidated infrastructure, and poor status of the rewards and morale of the academic staff seem to lead to a crisis in university education and research.

The time which qualified and experienced R and D workers can devote to actual R and D work is minimized by a shortage of efficient, well-qualified researchers and supporting staff. The social status, even of good researchers, tends to be as low as their income. There is a preference of R and D workers for theoretical research (Ph.D. thesis syndrome) and a relative distaste for practical application. Monitoring of research in progress and evaluation of R and D effectiveness are quite unheard of.

It is evident that, while it is essential for R and D institutions to establish a close relationship with the productive sector, effective linkages are often lacking. Research results, for example in the form of designs for more appropriate technologies, often stay on shelves instead of being tested and disseminated. One proven and significant reason for establishing linkages is the need for indigenous consultancy, which has the ability, knowledge and experience to tailor results to the practices and needs of the market.

An attempt was made to form Addis Ababa University-Ministry of Industry co-operation program in mid 1980's. The program had done quite a lot in solving industrial problems. However after the change in policy by the present government, from centrally planned economy to market economy, the university-industry linkage deteriorated and the program was suspended (*vide infra*).

Another attempt was recently made by the Technology Faculty so as to revive the linkage between the University and the industries.

## **4. University-Industry Linkage Programs**

### **4.1 Foreign Experience**

There is hardly any university in the developed countries that does not have some form of interaction with industry. These interactions are very greatly supported by the governments

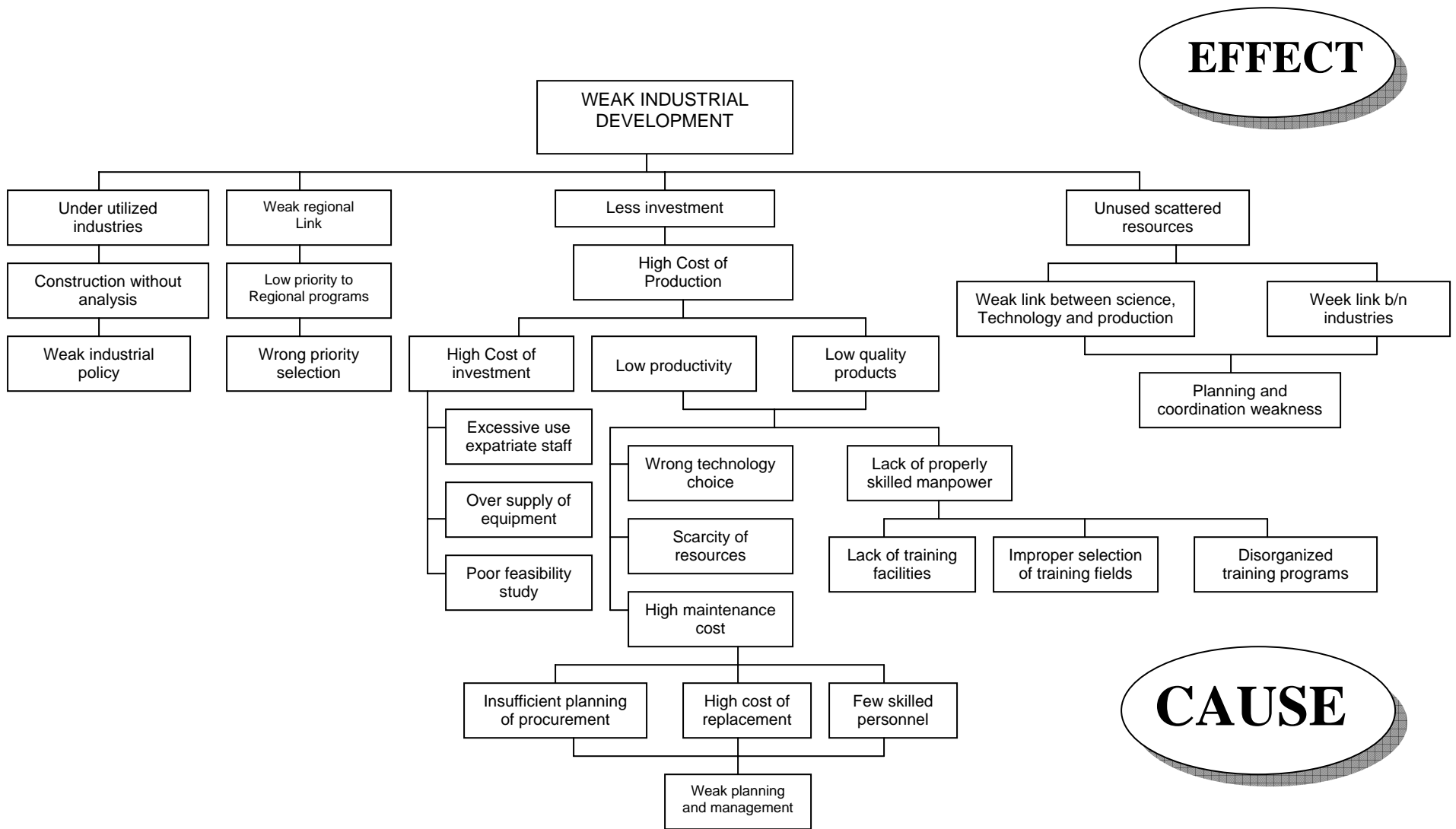


Figure 1 Problem analysis of industrial development

of the different countries for instance in the US, the National Science Foundation (NSF) is one of the many government agencies that play a great role in fostering university-industry interactions. It does this in several ways, some of which are: encouraging and providing partial support for academic and industrial researchers to cooperate in an **Industry/University Cooperative Research Project**. The projects are in specified areas deemed to be of great importance for the nation to be competitive; this varies according to the era: for instance, condensed matter physics, materials chemistry (polymers), biotechnology have all been or are presently receiving NSF funding under this program; establishing Industry-University Cooperative Research Centers; creating the **Small Business Innovation Research (SBIR)** program. SBIR provides an important opportunity for small science and technology-based firms to participate in NSF research and working with universities, government agencies and large companies.<sup>5</sup>

The nature of university-industry interactions varies widely. In some instances the interaction will be between a single industry and a university in a specific area e.g University of Texas and Raytheon Company in Systems Engineering Master's Program. In other cases it may be a university with a consortium of industries and in still other instances it could be a consortium of universities with a consortium of industries covering wide fields of cooperation. There have been several advantages to these interactions; among the most important advantages are the establishment of Science and Technology Parks near many universities (e.g the Research Triangle Park near the University of North Carolina) and of spin-out companies (e.g. the many biotechnology companies near Oxford University) near universities. These have benefited universities and industries in varied ways and have facilitated the university-industry interactions even more. It is not only the developed countries that have well established university-industry interactions but also the newly developed countries such as South Korea and Singapore which have used these interactions to be highly competitive in a variety of fields such as electronics. The Science and Technology Park set up near the University of Pune in India "proposes to convert into applied technology some of the discoveries and inventions of the University departments".<sup>6</sup>

Because the distinctive assets of a modern economy are now recognized as knowledge, skills and creativity, the future competitiveness of any country's business in this age of globalization will be dependent upon the country's ability to create innovation networks among universities, industries and government agencies. In the words of the US Council on Competitiveness **"Interconnectedness is one of the keys to competitiveness in the knowledge-based economy"**. The nation that fosters an infrastructure of linkages among and between firms, universities and government gains competitive advantage through quicker information diffusion and product deployment.<sup>7</sup>

#### **4.2 Addis Ababa University - Ministry of Industry Cooperation Program<sup>8</sup>**

The oldest national university, Addis Ababa University, has been the main source of trained manpower to the economy. There has been a continuous contact between individual academic staff members of the University and the industry. Many scientific researches have been carried and remarkable results obtained. However, a coordinated effort has not been made for the research outputs to make a significant impact on the society. This is simply

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<sup>5</sup> E.Bloch and C.E. Kruytbosch, "The NSF Role in Fostering University-Industry Research Relationships", IEEE Transactions on Education, E-29, 1986

<sup>6</sup> <http://intcent.unipune.ernet.in/site/interactions.htm>

<sup>7</sup> "Global: The New Shape of American Innovation" US Council on Competitiveness, September 1998

<sup>8</sup> Tarekegn Gebreyesus, "Past University-Industry Cooperation" March 1998 (Paper presented at a workshop on University-Industry Cooperation, March 27, 1998, Addis Ababa)

because of the lack of a sustainable institutional linkage between the University and the industries.

Some twenty years back, a number of meetings were held at the highest levels to establish a university-industry cooperation program. It culminated in the formation of the Addis Ababa University-Ministry of Industry Cooperation Program (UICP) in February 1986 through a formal agreement between the Addis Ababa University (AAU) and the Ministry of Industry (MOI).

The overall objective of UICP was to bring together Addis Ababa University and the Ministry of Industry so that they can accomplish their respective goals to achieve different aims. On the part of industry these aims included

- solving technical and managerial problems
- injecting new processes, technologies, etc
- maintaining and improving productivity and efficiency
- facilitating further training of existing staff, etc.

The aims of the university included

- practical training of students
- making R&D relevant while maintaining independence of staff
- augmenting its R&D resources with those from UICP
- obtaining feedback on the direction of R&D, curricula, teaching approaches and consultancy services, etc.

The UICP was composed of four bodies:

- the Policy Committee
- the Executive Committee
- the Secretariat
- and the Liaison Office

The Policy Committee was in overall charge of the UICP. It was composed of 12 university delegates and 13 from the Ministry of Industry and corporations under its control. Until the change of government in 1991, it was reported that the Minister of Industry, who served as the Chairman, ran the UICP personally through the Secretariat.

Funding was of two types: the regular budget for administration and office expenses was funded equally by MOI and AAU; the operational budget was funded partly by the two institutions and partly by "voluntary" contributions from the corporations of the Ministry of Industry. Each budget was approximately Birr 50,000 (US\$25,000) per year.

### **Operational Activities**

Some of the main functions of the UICP as described in the Policies and Procedures Manual included:

- research and development projects
- seminars, workshops and symposia
- thesis support
- sponsorship of students
- short courses
- AAU-MOI cooperation program week, etc.

It was reported that a number of projects had some kind of UICP involvement but it was difficult to ascertain whether these projects would not have been carried out even if UICP was not involved.

### 4.3 Technology Faculty – Industry Linkage Unit (TFILU) <sup>9</sup>

It is believed that some groundwork has to be accomplished in order to establish a sustainable University - Industry Linkage. To this effect the Faculty of Technology, Addis Ababa University, started a Technology Faculty – Industry Linkage Unit (TFILU) on its premises. The main objective of this unit is to pave the way for the establishment of sustainable University - Industry Linkage. It had the responsibility of conducting need and capability assessment of Technology Faculty and the industrial sector at large so as to form a strong foundation for a reliable linkage. The Unit examined the activities carried out by the Addis Ababa University – Ministry of Industry (AAU-MOI) co-operation program to learn from the successes and shortcomings of their experiences.

TFILU run its activities in collaboration with the National Advisory Body (NAB) of the Unit and the Addis Ababa University Research and Publication office. NAB is composed of members from the Ministry of Industry, the Ethiopian Science and Technology Commission (ESTC), the Public Enterprises Supervising Authority, the Chamber of Commerce, private companies and the Faculty of Technology. The activities to be carried out by the Unit towards meeting its objectives include;

1. Study on “Survey on Skill Needs and Capabilities of Technology Faculty and the Industrial Sector.”
2. Lay the foundation for (IT) technology information dissemination
3. Prepare and conduct summer courses for industrial personnel:
4. Organize seminars and workshops on recent industrial issues (at least one workshop and one seminar a year).
5. Organize educational visits and vacation jobs for students.
6. Conduct research activities on already identified problems of industry and promote and co-ordinate research activities in the Faculty.

#### Organization of the Unit

The Unit began its operation in July 2000, soon after the grant had been obtained from ESTC. The first few months have been devoted to organizing the office.

- The **executive committee** of the Unit, which has five members, was formed from various departments of the Faculty.
- **Sub committees** for Training, Research and Consultancy, Industry Job-Core, Workshops and Seminars, and Information Technology were formed maintaining the departments’ mix of the Faculty.
- **By-laws** of the Unit were drafted and discussed upon at all levels of the Unit’s organization.

#### Operational Activities

Some of the main functions of TFILU as described in its document include

1. Training
2. Researches and Consultancy
3. Industry Job-core
4. Workshops and Seminars
5. Information Technology

The initial fund to establish TFILU was provided by Addis Ababa University (in kind by providing office facility) and the Ethiopian Science and Technology Commission and was expected to continue. However the freezing of the project fund by ESTC made it very difficult

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<sup>9</sup> Daniel Kitaw “*Proposal for Technology Faculty Industry Linkage*” AAU, Faculty of Technology. Jan. 2000

for the Unit to carryout its activities as intended. This has jeopardized its activities and quenched the vigorous interests of the committee members who freely sacrificed their time and energy for the cause.

#### **4.4 Recent Developments**

In the first week of February 2006 the Ethiopian Manufacturing Industries Association took the initiative to carryout activities during the Ethiopian industry week. There were work shops, seminars and discussion forums during the week. The main topic that was debated upon was University Industry linkage. At the end of the workshop a steering committee was set up to follow the linkage issue through.

The committee then approached the Ministry of Capacity Building, Engineering Capacity Building Program. An encouraging progress has been achieved in the past three months. An international consultant (from Germany) and a national consultant have now signed contracts to carry out a study on university industry linkage and come up with a concrete proposal on the modalities of the linkage that has to be institutionalized.

In April 2006 a memorandum of understanding was signed between the Faculty of Technology, Addis Ababa University and the Ethiopian Manufacturing Industries Association. The cooperation was an outcome of the preliminary contacts and discussions made between officials of EMIA, and the Faculty of Technology. After the signing of the understanding the planning of joint activities (training, research, consultancy, exchange of staff and the like) is in progress by a joint team.

### **5. A Way Forward<sup>10</sup>**

#### **5.1 Development Rationale**

The Ethiopian industries are operating in business environment characterized by unprecedented global competition and technological change. Furthermore, their efforts fail to result in improved tools, equipment and services reaching the community. For the industries to survive and be competitive it is essential that they have to consciously link with higher education and research institutions so as to optimally use the available scarce resources of county.

The existence of scientific and technological institutions in the country doesn't guarantee the provision of appropriately skilled workers and relevant research out put to satisfy the immediate needs of the industry.

The proposed Center, in this study, is not in the slightest to duplicate what the others are doing nor to create a giant institution as to satisfy the national pride. But, it is an attempt to make a conscious and co-ordinated effort in order to integrate the scarce available resources of the country. On one hand, it would provide a linkage to integrate the resources available at higher education institutions and the industries, and set research priority areas and bring an immediate impact on the rural communities. On the other hand, the proposed Center would enhance the underutilized industries to produce better tools and equipment and would thus provide a direct stimulus to the industrial development.

As a cross-sectoral project, the counterpart institutions would be the Ministry of Trade & Industry, the Ministry of Education, the higher education academic and research institutions, Ministry of Capacity Building, Ethiopian Manufacturing Industries Association and Chamber of Commerce.

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<sup>10</sup> Ideas are taken and adapted from "Proposal for a Sustainable University Industry Linkage Program" Tarekegn G. Yesus and Daniel Kitaw AAU Dec 2003.

## 5.2 Objectives of HEIRIC

This proposal has the main objective of establishing a "Higher Education–Industry Resource Integration Centre" (HEIRIC). The primary thrust of the proposed HEIRIC, is to integrate the Higher Education Institutions staff and students as well as its research infrastructure to resolve problems of industries and boost productivity and to improve their own teaching and research capabilities. To realize this objective, HEIRIC plans the following distinct but interrelated activities.

1. Short term training courses tailored to industries in various fields and at different levels.
2. An internship program (or vacation jobs) for pre-graduating students in industry during their study period.
3. Organizing sponsorship program for students
4. Carrying out research activities based on the needs of the industry
5. Involving the University staff as advisors to industries especially as counter parts when the industry is involved with foreign advisors.
6. Inviting experienced industrial workers as part-time lecturers, guest lecturers or through joint appointment both at under-graduate and post-graduate level.
7. Strengthening and developing research facilities of the Technology and other Faculties through the fund generated.
8. Providing technical support during purchase and running of sophisticated equipment.
9. Promoting and fostering appropriate "Technology Transfer".
10. Prototype development and building *incubation units*.
11. Promoting and initiating *Techno parks*.

Such activities and interactions would be of benefit to both industry and university by enabling them to

- Establish multidisciplinary programs that are responsive to industrial needs
- Carry out specific company-sponsored projects
- Strengthen team-based, cross-disciplinary, problem-solving industry-university exchanges by placing faculty and students at industry sites and industry scientists/engineers at the university
- Provide a real world and a high-calibre educational experience for graduate and undergraduate students.

## 5.3 Organisation

HEIRIC requires a Board of Directors (composed of government, higher education institutions and the industries), which will be vested with responsibility for establishment of policies, and strategy, and supervision of its activities. The Board should be represented by the following (with additional members to be added as needed)

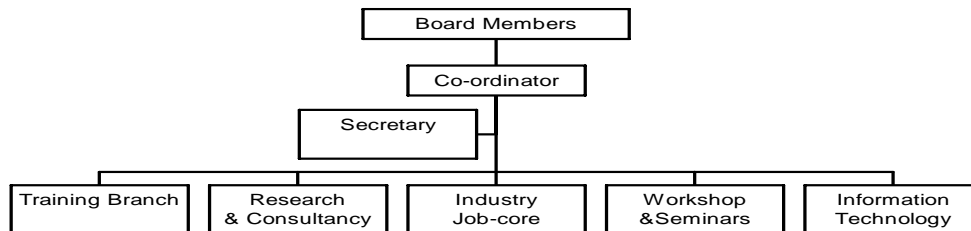
- Ministry of Capacity Building	(one)	1
- Ministry of Education	(one)	1
- Ministry of Industry	(one)	1
- Science & Technology Agency	(one)	1
- Public Enterprises Supervising Agency	(one)	1
- Public Higher Education Institutions	(Five)	5
- Private Higher Education Institutions	(Three)	3
- Ethiopian Chamber of Commerce	(one)	1
- Addis Ababa Chamber of Commerce	(one)	1
- Professional Association Joint Secretariat	(one)	1
- Private Companies	(five)	5

Membership to the board shall be on a three-year rotation basis. Under the guidance of the Board members, the Center director serves as chief executive officer of HEIRIC and will

be responsible for the planning, direction, supervision and control of all day-to-day activities of the centre.

Under the Center director there will be committees (figure 3) responsible for

1. Training
2. Research and Consultancy
3. Industry-job core
4. Workshops and Seminars
5. Information Technology



**Figure 3** Proposed Organizational Structure of the HEIREC

### **Training**

The objective of this programme encompasses both formal and informal education and other forms of learning experiences. It relies on structured approaches to knowledge and skill enhancement that better match labor force needs. It is possible to have three different types of trainings: tailored; off-the-shelf; and combinations of tailored and off-the-shelf trainings.

### **Research and consultancy**

The main objective of the Research & Consultancy branch is to facilitate a conducive environment for researchers to carry out researches that are relevant to the Ethiopian industries.

### **Industry-Job core**

The primary objective of “Industry-Job Core” programme is to introduce students into the workplace early on their academic studies. The programme has dual impact. First, it helps to close the gap between the academic studies and the practical application of acquired knowledge and skills in the working environment. Secondly, it provides the industry with an opportunity to access semi-skilled labor as well as to have direct influence over the development of skills of future graduates.

### **Workshops and Seminars**

The objective of this programme is to organize relevant workshops and seminars on a regular basis and disseminate the outcomes using newspapers, newsletters, professional journals or any other appropriate means.

### **Information Technology (IT)**

The objective of this programme is to electronically network higher education institutions and industries. To this effect the network set up by Addis Ababa University (AAU) promises a revolution in information gathering and dissemination both for institutions of learning and the public at large. For industries affiliated with the HEIRIC, the network promises to greatly increase their information gathering capacity; with the envisaged computerization of the library system at AAU.

## **5.4 Source of Finance**

The initial fund to establish the HEIRIC is expected to come from the Ministry of Capacity Building, Ministry of Trade and Industry, Ethiopian Science and Technology Agency, public and private Higher Education Institutions and Manufacturing Associations. In due course the Centre will search for internal and external collaborators both in the public and private sectors. It will also start generating its own fund through consultancy and training activities.

Basically, profit making is not the Centre's principal objective. However it shall generate reasonable incomes by rendering consultancy and/or training services to the community at large and to the industries in particular. The Centre shall also seek donations, in cash and/or other forms, from national and international institutions wishing to support its objectives.

The Centre shall encourage industrial firms and organizations to be its institutional members and pay nominal standing fees and, as a reward, get a 15% reduction for institutional members and 10% reduction for associate institutional members on the charges for consultancy and/or training services.

## 6. Concluding Remark

There have been many attempts, by national and international organizations, to resolve the problem of technological under development. Some of the efforts made are establishments of industrial plants, design centers, scientific and technological institutions and the like, in addition to the seminars, workshops, trainings abroad and advisory services at different levels. The effort made by many governments, donor organizations and international agencies is undoubtedly remarkable and has addressed the problem to a certain extent. However, the attempt lacks a co-ordinated effort and falls short of making the maximum out of the existing under-utilized industries, reforming the weak regional co-operation, making the industrial ambient attractive to investors and strengthening the link between University, Industry and Government.

The past Ethiopian University-Industry linkage experiences were primarily anchored on administrative decision rather than being on needs and demand. The administrative decision was easily executed for it was public-public partnership. The current and future scenario would be complex: public-public, public-private and private-private: where the players would be both public and private higher education institutions and industries owned by the government and private sector. The Centre would be established on true demand and assured sustainability.

Based on the experience of other countries, AAU-MOI cooperation program, TFILU, and the felt need that exists in the industries, the author strongly recommends:

1. Ministry of Capacity Building, Ministry of Education, Ministry of Industry and Trade, the Ethiopian Science and Technology Agency, public and private Higher Education Institutions and the business community should make a coordinated effort to establish and strengthen a nation wide **Higher Education - Industry Resource Integration Centre**.
2. Secondly, all higher education Institutions should start **linkage units at an associate vice president and associate dean level** as early as possible. And those who have already started should properly appreciate the efforts made and strengthen the initiatives.