A Science and Technology Education Portal for Ibero-America

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Abstract: The world has become dependent on information, technology, and telecommunications, better known as Information Technology (IT). Increasingly, IT is an effective indicator to measure the difference between developed and developing nations. The competitiveness and economic growth of a nation are directly related to the incorporation of clear policies on IT. It requires a substantial restructuring of the initiatives and programs implemented in attempts to generate an adequate base for development of science and technology. To achieve this, it is important to revise the education of human, technical, and scientific resources. Since its creation in 1990, the non-profit Ibero-American Science and Technology Education Consortium (ISTEC) stated as its mission: to foster science, engineering and technology education, joint international research and development efforts among universities and industries, and to provide a cost-effective vehicle for the application of technology. ISTEC is comprised of educational, research and industrial institutions throughout the Americas and the Iberian Peninsula. The objectives of the consortium are to conceive, plan and carry out activities of higher education, research and development, and technology transfer, for the purpose of facilitating scientific and technical progress of the Ibero-American countries. Within the initiative called Los Libertadores, ISTEC has defined the Science and Technology Education Portal Project (STEP) to provide its members with a real-time forum on IT with special services to satisfy the needs for information on science and technology in the region.

Index Terms: Portal, Backbone, Collaboration, Initiative, Education.

1. Introduction

Information Technology (IT) is an effective indicator of the difference between developed and developing nations. More than ever, governments, industry, academia, and international organizations have a social responsibility to their citizens in reallocating resources to dedicate them to Science and Technology (S&T) in order to rise standards in education, mobilize market forces and secure a better development for the new generations of the XXI century. No country can ignore the benefits and opportunities to transform society that are available with the tools based on IT. For maximum benefit, adequate and appropriate policies in IT are essential requirements for productivity growth and development in the private and public sectors. This must take place with total participation from society, the "Digital-Divide" barrier must not be created. Metrics involved with IT policies are necessary instruments to induce market forces to ensure development goals and generate public and private investment The degree of success that they experience in economic and social development will be directly proportional to strategic investments in science, technology, information systems and human capital.

The Ibero-American countries have a second chance to integrate themselves through Science and Technology, this agrees with the new multilateralism being supported by all nations. By integrating the region they are placing

the region in a leading role and provide a response to the challenges from other regions. This new renaissance will create new opportunities for business, academia and governments, will help reduce the existing inequalities and create/enhance the human capital needed for the future. Resources must be shared at a national, regional, and global level. These are becoming more limited in the amounts and by the number of growing institutions that compete for them. Strategic alliances (consortia) among academia, industry, government agencies, and international organizations are essential. These must promote project identification, partnering and funding to diversify and expand the capabilities of projects. If done correctly, these alliances will improve the Latin American profile in S&T by increasing the quantity and quality of publications, production of science, and participation and organization of international forums. These alliances are also important to promote and raise the awareness on the need to create/enhance S&T sustainable policies and infrastructure. S&T needs to form an integral part and be top priority for the economic development and sustainable growth of the region. Average investment in S&T in the region is 0.5% of GDP. A key factor in the success of this endeavor is the instigation of effective procedures for searching, processing, and distributing information in a minimal amount of time.

Worldwide the demand for IT personnel far outstrips supply. The globalization and integration of the world's markets is forcing industries to search for talent in other parts of the world, particularly in Latin America. According to trends and studies conducted by American industries, the next decade points to Latin America. Clearly, hands-on education, research, and technology transfer in state-of-the-art technology and science is critical for the success of Latin America. The fastest growing area on the Internet is Latin America. Like capital and labor, information is considered a vital factor to production. In the decade of 1980, the information sector amounted from 30-50% of GDP and employment in the developed countries of OECD. This sector will increase to 60% among the European Union countries. In the telecommunications context, this is considered a strategic investment to maintain and develop a competitive advantage at national, regional, and hemispheric levels. Countries and industries that do not have access to modern communications systems will not be able to participate effectively in the global economy, and will not fully develop economically or socially. This is a critical reality to those countries in the region that aspire to become developed [1]. Table 1 shows several world indicators in IT and S&T.

Table 1. IT and S&T indicators [2,3,4]

Teledensity (telephone lines per 100 inhabitants):	
Industrialized countries	> 48 %
Countries of medium development	~ 10 %
Countries of lesser development	~ 1.5 %
World average	11.5 %
Informatics Gap (PC's per 100 inhabitants):	
Industrialized countries	> 18 %
Countries of medium development	~ 2.3 %
Countries of lesser development	~ 0.01 %
Participation in the IT Market:	
U.S.A.	34.7 %
Europe	29.3 %
Japan	14.6 %
Rest of the World	21.4 %

In this paper, in section 2 we describe ISTEC and its activities; section 3 describes the STEP Project and in section 4 we present the conclusions.

2. The Ibero-American Science and Technology Education Consortium (ISTEC)

In the summer of 1990 personnel from the University of New Mexico visited countries in Latin America to identify and evaluate opportunities for successful collaboration in an international effort in science and technology

education. Meetings were held with officials with various governments, educational institutions, research facilities, and industrial firms to gage interest in establishing efforts of cooperation in technical fields. The meetings resulted in the identification of areas of common interest for employing hands-on education, research, and technology transfer in state-of-the-art technology and science. These discussions, which resulted in the creation of the Ibero-American Science and Technology Education Consortium (ISTEC), identified a number of obstacles that need to be addressed:

- Lack of current information for planning and developing technology.
- Lack of expertise in the use of information.
- Lack of international cooperation in developing the critical mass needed for projects and joint efforts.
- Lack of availability of technology.
- Lack of interaction (lack of confidence and sometimes lack of information) between universities, industries, governments, and international organizations.

The above difficulties are aggravated by another problem, which is the lack of awareness of the simultaneous existence and interaction of the above obstacles. As a result of these meetings, ISTEC was created, and universities, industries, and other organizations become members by signing a Memorandum of Understanding (MOU). The organizations that constitute ISTEC have agreed upon the following Mission Statement: ISTEC is a non-profit organization comprised of educational, research, and industrial institutions throughout the Americas and the Iberian Peninsula. The Consortium has been established to foster scientific, engineering, and technology education, joint international research and development efforts among its members, and to provide a cost-effective vehicle for the application and transfer of technology.

The objectives of the Consortium are to conceive, plan, and carry out activities of higher education, research and development, and technology transfer, for the purpose of facilitating scientific and technical progress of the Ibero-American countries. The mechanism developed by ISTEC to work on its objectives is the Initiative, which is an organized effort to create activities to address a specific area of concern. The Initiatives are member-driven, flexible, and run concurrently. Within initiatives, projects are identified, planned, and implemented. The distributed structure from which the projects stem avoids duplication of efforts and inherently responds to the needs of the ISTEC membership. Projects are designed with both short- and long-term goals, as well as consideration of social impact. They are dynamic and expandable, and coordination is encouraged in order to maximize the utilization of available resources. Currently, there are four Initiatives underway:

1) Library Linkages Initiative: This Initiative seeks to modernize document delivery as a component of education and research, as well as policy design. This initiative also seeks to broaden electronic availability of research materials, to upgrade the information system skills of library staff, and to sharpen the savvy and independence of the electronic library user. The ISTEC Cooperative Interlibrary Loan project has facilitated installation of Internet based document transmission software, trained users to electronically research science and engineering databases, and coordinated electronic request and transmission of documents among libraries of ISTEC. To date, projects within the Library Linkages Initiative have trained in excess of 5,000 people, transferred over 250,000 pages of documents, created regional inter-library loan systems, established an on-line journal for Information Technology, established databases for local library collections, and developed software for document transmission as well as a search engine for retrieval of on-line journal information.

2) Advanced Continuing Education Initiative: This initiative seeks to upgrade the available skills and increase the number of qualified individuals in applicable areas. Projects conducted within the auspices of this initiative involve curriculum adaptation, design and enhancement, professional development, on-site training, web based distance learning, as well as non-traditional faculty, staff, and student exchanges, including “sandwich” graduate programs. Regional partnerships are evolving to meet these goals. At the present time, ISTEC is developing a web-based network for training throughout the region that will make state-of-the-art technology available to a variety of personnel, foster horizontal collaboration, and produce material for the improvement of education, research, and development in the region.

3) Research and Development Laboratories: This initiative has been created to provide a vehicle for performing research and development in a variety of informatics and telecommunications related areas. The laboratory facilities are also designed to be utilized in teaching situations, and are being used to enhance interaction between industries and universities. At the present time, over 125 processor laboratories have been established throughout the region and provide a common platform for sharing knowledge, exchange of information, and enhancement of curricula materials for undergraduate and graduate education. These processors include micro-controllers, microprocessors, and digital signal processing systems for applications that manipulate the characteristics of signals or images. These laboratories are distributed throughout 24 countries. Key in this development have been Motorola, Nortel Networks, Sun Microsystems, Microsoft, Fluke, Khoral Research, Synopsys, VeriBest and Invenio.

4) Los Libertadores: Seeks to create a flexible network of telecommunication services (a hemispheric backbone for academic and R&D purposes), computing facilities, and teaching stations, known as "Centers of Excellence". The common thread is to develop human capital, emphasizing the involvement of both public and private institutions that implement training, research, and academic exchanges in science and technology within the region. Each country or region identifies needs that must be met, and then designs a Center of Excellence to address those needs. Each Center of Excellence brings together people from the private sector, the public sector, and the educational system to work together to find solutions to the problems of interest.

3. The ISTEC Portal: a real-time forum on IT

The initiative of Los Libertadores is a "common thread" effort that links together all of ISTEC's goals and objectives. Taking advantage of the current information technology and the web, ISTEC is developing the Science and Technology Education Portal (STEP) Project within Los Libertadores. The goal of STEP is to provide ISTEC with a multilingual (English, Spanish and Portuguese) real-time forum on IT. The Portal is to be easily accessible, and well organized web-based system, which will allow the offering of electronic services to all ISTEC members. ISTEC academic member institutions will be provided with the necessary infrastructure in terms of hardware, software and protocols, that will allow them to run this system, to access all sources of data, information and knowledge available to the consortium, and to contribute significantly to the enlargement and improvement of its data, information, and knowledge collections. The system will provide mechanisms for data gathering, information retrieval, reporting and advanced data analysis for exploration and query answering. The data gathered through the portal will be integrated with ISTEC's Distributed Database of expertise and activities.

The portal will allow ISTEC to:

1. Provide a real-time forum for discussion on important topics, for example, S&T policies, IP protection, development of hardware and software industries in Iberoamerican countries, ethical guidelines to help support the transfer of technology from academia to industry.
2. Help accelerate the technology transfer from industrial members to academic members.
3. Contribute to the long term enhancement of engineering and science curricula in the academic institutions by providing them with information and a discussion forum about the industrial member needs in the region.
4. Provide complete information about R&D projects within ISTEC and continually update information about available sources of funding for these projects.

There are general requirements for this web-based system are: The contents should be very easy to update and maintain. The system should be very flexible, in a way that it adapts itself to the natural evolution of the consortium and its collections. The system will provide mechanisms for data collection, information retrieval, reporting and advanced data analysis for data exploration and query answering. The data gathered through these mechanisms should be categorized into a variety of relevant classes, for example, industry sector, region.

The ISTEC Distributed Database Project (BDDIS) has a very strong link with this project for several reasons. BDDIS was conceived as a means of structuring, storing, maintaining and querying all the relevant information of the consortium. With the notion of a Portal all access to the consortium information collections will be made through the web, specifically through the portal. Therefore, the applications that will use ISTEC's databases, should be considered as part of the portal.

Some general services which can be provided with the system are listed below: Email, discussion boards and collaboration services through the web. Archival and retrieval of discussion board contents. Membership Registration and Services. Calendar of events services. ISTEC News services. Science and Technology News Services. Event Registration services. Organization and use of ordered lists for the distribution of products to member institutions. Links to other institutions web sites. Administrative services for bulk purchases by member institutions. E-commerce capabilities for course, data, publication, product, and group sales.

At the present time, installation is proceeding on a major aspect of this system, which is a network of communication servers. This infrastructure will form the core for the "IT Challenge" effort, a real-time forum where the issue on IT for Development can be actively pursued.

4. Conclusion

The interest in international efforts in technical cooperation for academic and developmental activities is evidence of the continued globalization and interdependence of nations. The strength and versatility of a region is dependent upon the ability of the region to adapt and apply new technology to the problems which exist. The Ibero-American Science and Technology Education Consortium was organized to provide a mechanism for international cooperation in the areas of science and engineering. Participating ISTEC institutions share up-to-date education, transfer of technology, research, and development in areas of mutual concern. Ideas are exchanged, initiatives undertaken, projects developed, and information shared in an atmosphere of trust and integrity. The Consortium is developing common programs in diverse areas, facilitating the transfer of information, expertise, and capabilities. With the Portal effort we will put the latest IT technology to work for this objective and we will create a culture in these institutions so that they use this infrastructure to enhance their collaboration activities.

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