European Journal of Engineering Education
Vol. 31, No. 3, June 2006, 349–358

Taylor & Francis
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Transforming academic globalization into globalization for all

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(Received in final form 15 February 2006)

Driving innovation and continuous improvement with regard to ecological, environmental and human sustainability is essential for win–win globalization. That calls for research on strategic and monitoring planning to manage globalization and technological and scientific change. This paper describes a new basic function of the university institution 'to teach students to be critical about any kind of information' and presents perspectives, efforts and three proposals for the establishment of a system for managing globalization and technological and scientific change.

Keywords: Bastion of globalization; Globalization management; Trans-disciplinary/integrated knowledge; 'Hybrid' university structure

1. Introduction

At the time of Google, Yahoo and Quaero (I search) the university institution (UI) has to add a Trans-disciplinary integrated knowledge (TIK) dimension to its discipline structure, innovate its teaching/learning processes and find common ground on which to undertake a dialogue on the major issues and new ideas, between engineering (for the sake of simplicity here meaning science/technology/engineering) and other knowledge communities in order to help manage globalization and technological and scientific change. For that the UI has to engage in very ambitious global projects and tasks.

One important question is how do we find a way for the usual players to talk (listen and be heard) to each other efficiently and to society in order to come to a political and economic construct that preserves and expands the positive effects that have produced globalization as it is today.

With this aim it is good to know that some multinational chief executive officers (CEOs) are demanding foresight not hindsight, innovators not tacticians and market strategists not marketing planners. Most CEOs of modern multinational enterprises define the 21st century enterprise as a value creator enterprise open to diversified cultures. Clearly to manage globalization and technological and scientific change it is necessary to take a more holistic view and a better interaction across all relevant knowledge areas. That calls for the development of

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European Journal of Engineering Education
ISSN 0304-3797 print/ISSN 1469-5898 online © 2006 SEFI
http://www.tandf.co.uk/journals
DOI: 10.1080/03043790600644123

the so-called TIK dimension. To better evaluate the need to explore the TIK dimension in the context of scientific change reading of *Nous, La Particule et le Monde* (Nicolescu 2002) is recommended the book. This shows how recent discoveries in quantum physics have led to a new vision for science, more holistic and linked to culture, religion, politics, arts and education.

The UI (one of the oldest and most stable institutions located in different countries) is still a unique knowledge institution on the planet. It has long been a place of research and education in all knowledge areas (including engineering, economics, culture, religion, history, political science, social science, etc.).

Engineering has a common language, but its progress is often dictated not by engineering factors, and the same is true of its priorities, which are neither necessarily common nor uniform. However, although engineering is very much dominated by politics and economics, it could also influence politics and economics a great deal. In fact, once scenarios or problems have been identified, adequate solutions can be sought by virtual experimentation through continuous advances in information and communication technologies (ICT), simulation software and 'virtual reality'. Those tools allow the analysts to see how the system behaves even before a prototype is built (for details see Swain 2005, americasarmy.com). They allow the implementation of new designs, improvements and innovations in production or other processes at much lower waste and risk.

This is a promising avenue to follow that needs new quantitative and qualitative TIK research and even demands innovation in the existing voting paradigm, i.e. when there is no consensus as to the 'best solution' opposition for the sake of opposition is no longer tolerated and both yes and no votes have to be justified. It is necessary that people know the 'what', 'why' and 'how' of the subjects about which they are taking crucial decisions.

Changes in several aspects of the UI culture are further required, like social image displacement and intelligent ways of attracting the attention of society. It will be necessary that the UI sets up internal and external dialogues, partnerships and joint actions to properly address the different research and education needs of the most relevant components of the TIK dimension.

In conclusion, a bastion of globalization that can help globalize the world, in a positive sense, is needed. That calls for research on strategic and monitoring planning to manage globalization and technological and scientific change. This paper is an attempt to address this issue inside the UI.

The paper is divided into four sections. Section 2 discusses the role of the UI in globalization, defines the UI's new basic function and outlines two research project proposals for discussion, the Internal TIK Platform and 'Hybrid' University Structure. Section 3 introduces the third research project proposal, the University Dialogue and Partnership Global Trust, and discusses the more relevant TIK dialogues and partnerships needed. The paper ends with conclusions.

2. The role of the UI in globalization

2.1 *The UI and its new basic function*

In the middle ages the function of the UI was to obtain, preserve and disseminate knowledge, such that this knowledge was not lost. Nowadays, almost everything is claimed to be on the Internet! However what the Internet provides at present is not properly knowledge, but information. Even knowledge in itself is not enough. We remain vulnerable if we know the 'what', but not the 'why' and 'how'. What we have at the moment is only an explosion of electronic communications technologies that have invaded everything and took many by surprise.

The Internet and other ICTs, as well as the new globalization paradigm formed by the multinationals and markets, does not necessarily decrease the role of the UI. On the contrary,

it stresses the need for the UI today as much as in the middle ages, and for somewhat equivalent reasons. It also calls for specific innovation inside the UI to address its new basic function: to teach students to be critical about all kinds of information. What is the source of that information? Who has credited it as true? Why? What is the scientific proof? Does scientific proof change from one scientific area to another? What is an opinion? What is a fact? And so on. Nowadays it is critical to clearly understand these questions. This stresses the importance of the TIK dimension to establish a kind of common formal language and a coherent body of rules and regulations among all knowledge areas to facilitate good and efficient communications among the different disciplines and knowledge areas, these to be enforced on all, when and where needed. That is to say, to fulfil its new basic function the UI will need to set up TIK dialogues, at least inside its headquarters.

The following research project proposal is an attempt to address this issue.

2.2 *The Inner TIK Platform research project proposal*

The objectives, background, motivation and leader's profile of the Inner TIK Platform research project are described bellow. To explain what is meant by a specific TIK education activity the concept of TIK engineering courses and degrees is introduced and discussed in 2.2.5.

2.2.1 Objectives. The main objectives of the research project are to discuss and implement specific TIK research and education activities and promote continuous improvement and innovation inside the UI.

2.2.2 Background. Within a specific discipline or in a specific area of it the UI has a successful tradition of operating at the global level and learning from collaborators from different cultures. However, it rarely happens between disciplines or knowledge areas. Should researchers in different disciplines be encouraged to set up joint research and education projects to take advantage of their complementarities, in order to create a relevant TIK knowledge area? Can each researcher learn how to preserve each others roots and at the same time open doors to help create a constructive joint research TIK adventure? Perhaps not all should be encouraged to do that, only those who feel the call. If done intelligently it will be a source of respect for differences and of mutual enrichment, otherwise it could lead to confusion and mental anquish.

2.2.3 Motivation. Inclusion of the TIK dimension in the discipline structure is expected to nullify a concentration on one's own operation and open people's eyes to each others prejudicial ideas. This might facilitate brainstorming on different approaches, peer review and a multiplication of viewpoints, theories and models, as well as favour the development of a capacity to listen to others, curiosity and imagination/creativity. This also implies responsibility for all actors, whoever they are. It is also expected to be a powerful element leading to innovative cross-research and cross-teaching performance as a duty, at higher quality and minimal cost. If successful it will also minimize the risk of a much smaller budget for a specific discipline or knowledge area when it becomes less fashionable.

2.2.4 Project leader's profile. Conditions of authority and legitimacy:

- capacity to establish objectives;
- transparency in their actions;
- taking responsibility for the results.

Objectives:

- realistic;
- reflect a long-term strategy;
- clear;
- measurable;
- scaled over the time period.

Duties:

- have the courage and honesty to fight difficulties;
- take the needed decisions and explain them;
- assume the past, present and future;
- directly or indirectly listen to all the actors in all sectors and at all levels;
- based on raw data make a shared diagnosis to find and to apply 'best' solutions;

Main characteristics of external information:

- authenticity;
- reliability;

This project leader's profile is common to all the three research projects.

2.2.5 Example of a specific TIK education activity. A TIK engineering course or degree is here defined as a course or degree in engineering and another non-engineering knowledge area on an equal footing. To identify the needs of and set up an adequate TIK engineering course or degree is a relevant specific TIK education activity.

Nowadays all technical universities have a TIK engineering and management degree. However, TIK engineering courses or degrees in journalism, law, political sciences and social sciences are now clearly needed, but do not seem to exist yet.

The motivation for a TIK engineering and social sciences degree is as follows. On the one hand, engineers, apart from having to keep track of the kernel of their engineering expertise, have to communicate efficiently with society in general and to work in teams with other social agents on a world scale. On the other, social sciences students, due to their importance in present day society, should have a better understanding of mathematics, statistics and other more demanding disciplines. Present social sciences degrees do not seem to properly provide that.

TIK engineering and journalism courses and degrees are relevant to the UI needs of social image displacement and attracting the attention of society. And, on the other hand, they are relevant to promoting and assisting serious technical journalism (i.e. a deep understanding and competent follow-up of the matter discussed).

2.3 *'Hybrid' University Structure research project proposal*

The proposed objectives, background and motivation are described below.

2.3.1 Objectives.

I. To structure the concerned traditional university to provide 'elite' education and 'mass' education to its students nationally and internationally (by, for example, engaging in an e-learning initiative of the GUS type).

II. To set up means to take full advantage (inside the two education systems of 'elite' and 'mass' respectively) of the existing advanced e-learning techniques and advanced telecommunication infrastructures.
III. To further explore successful teaching/learning experiences to provide continuous improvement and innovation in mathematics and physics educational productivity at all levels (including that of very young children's by play and life-long education and training).

2.3.2 Background. The proposal was inspired by the Global University System (GUS) initiative (Utsumi 2006). GUS is a world wide initiative to create an advanced telecommunications infrastructure allowing access to educational resources across national and cultural boundaries for global peace. It aims to create a world wide consortium of universities to provide the underdeveloped world with access to an 21st century education via broadband Internet. The type of education provided by GUS is here termed 'mass' education. The traditional university education is here termed 'elite' education. A traditional university that has chosen to join to a world wide consortium of the GUS' type is here called a 'hybrid' university. It is assumed that the difference between a 'mass' education and an 'elite' education is mainly in the e-learning methodology and environments used, and perhaps in a different approach to the discipline structure.

2.3.3 Motivation.

1. Nowadays, it is important to provide engineering students with a solid undergraduate education in mathematics and physics, among other demanding disciplines.
2. It is equally important to provide non-engineering students with a basic understanding and a common scientific language.
3. Poor countries in Africa, Latin America and Asia above all need mass education of their huge young populations.
4. Some countries in Europe have a high percentage of students who show extremely poor performance in mathematics and other more demanding disciplines.

To address point 3 'mass' education by e-learning type is needed. To address the other points improvements and innovation in the teaching/learning processes in use in the UI is needed. It is reasonable to assume that to properly teach mathematics and physics 'mass' education will be forced to explore creative teaching/learning environments and use the latest findings in the psychology of human learning. Therefore the traditional university that became a 'hybrid' university will greatly benefit from that too.

The position of and predictions for distance (ICT-based) learning development reported by Ramalhoto (1995) cannot be compared with its potential position today, particularly if the traditional university understands the importance of structuring itself in order to became a 'hybrid' university. At the European level there are already several important e-learning initiatives active, like EUNITE, EuroPACE, EU Thematic Network E4 and the European Virtual University. In research, the European Union is already creating virtual institutes, which could also take part in teaching and research supervision activities via the web. What seems to be needed is a project covering all existing European e-learning initiatives and the traditional European universities concerned to promote, structure and manage joint e-learning activities. That could perhaps be achieved through a European project (or programme) of the 'Hybrid' University Structure type.

3. UI outer dialogue and partnership

In this section the objectives, background and motivation of the third research project proposal, called the University Dialogue and Partnership World Trust (UDPWT), are described. That completes the presentation of the three-fold strategic plan to manage globalization and technological and scientific change.

3.1 *UI Dialogue and Partnership World Trust research project proposal*

3.1.1 Objectives.

I. To identify TIK players, strengths, weaknesses and challenges.
II. To promote TIK education, research and innovation.
III. To serve as a 'dynamic encyclopedia and observatory' for all disciplines and their interactions.
IV. To promote TIK global dialogue and partnership.
V. To facilitate TIK brainstorming and think-tanks, leading to relevant outputs being put on the global media.
VI. To assist and promote targeted independent groups formed from a cross-section of the population (including schoolteachers and concerned citizens) for long-term planning to manage globalization and technological and scientific change.

The UDPWT proposal is not to replace anything that already exists. On the contrary, it is meant to be a synergy promoter too. For instance, it will not replace individual, peer reviewed journals in the various discipline areas and cross-disciplinary journals. On the contrary, it will facilitate their creation and promote them globally among cross-discipline experts and practitioners.

3.1.2 Background and motivation. The background and motivation of this proposal are mainly in the context of industry, where a completely new epoch seems to have begun, as reported in sub-section 3.2, and the new arts partnership under the so-called 'creative' industries, as reported in sub-section 3.3. Another relevant source of background and motivation in the context of civil society development is reported in sub-section 3.4.

3.1.3 Implementation. An interesting source of inspiration for the UDPWT proposal is the Intelligent Manufacturing System (IMS) Programme (in action since 2000), briefly described and discussed in 3.2.3.

3.2 *Technological university and industry dialogue and partnership*

3.2.1 The European Commission (EC). In Europe, mostly in the last two decades, the EC has been a facilitator, sponsor and driving force behind UI improvement and innovation in teaching, research, and promotion of research and teaching consortia inside the UI and between the UI and industry, as well as in distance/ICT learning and continuing education/lifelong learning. Recent examples are: the European Research Area (ERA), the European Credit Transfer System (ECTS) and the European Higher Education Area (EHEA)/Bologna process. The next, sixth framework (2007–2012) of the EC is expected to be even more influential through, for example, the creation of dedicated TIK platforms. Further information is available from http:europa.eu.int/comm/education/policies.

3.2.2 Industry–academia partnerships in the recent past. On 28–30 April 1992 the Second European Forum for Continuing Engineering Education: International Cooperation Between Industry and Academia took place in Lisbon. It was a joint venture of SEFI, FEANI (European Federation of National Engineers Association) and IACEE (International Association for Continuing Engineering Education), almost self-financed through participants' fees (about 150 participants from 20 countries, 28% of whom were from industry and trade unions, 41% from universities and 31% from non-university institutions of science and technology). The main topics discussed were 'Human resources development strategies' (Siemens, Agnelli Foundation, Sir Robert Telford and other representatives of the European Union), 'Environment and related ethics issues' (UNESCO, international code of environmental ethics for engineers), 'European flexible and distance education', 'Accreditation and credit transfer', 'Total quality management', 'Technology management', 'Networks and information channels' and 'Improving educational productivity'.

No global scale project or programme was presented or discussed and the word globalization was not even mentioned. All the described collaborations among universities or involving universities and industry were located in Europe and were sponsored by EC programmes.

The next IMS example of a novel TIK cooperation between industry and academia on a global scale clearly shows what can be achieved and how far cooperation between industry and academia is today from April 1992.

3.2.3 The IMS programme. The following IMS, launched in February 2000, is an industry led, government facilitated international research and development programme established to develop the next generation of manufacturing and processing technologies. Participation is global and includes companies and universities from Canada, the USA, the European Union, Norway, Japan, Korea, Switzerland and Australia. It has been reported that properly managed international cooperation in advanced manufacturing research and development, through IMS, improves manufacturing operations, enhances international competitiveness and leads to technology breakthroughs via market driven research and development.

IMS is the only government sanctioned programme in manufacturing with a focus that crosses multiple international boundaries. It provides an effective support structure for research and development projects within specific arrangements for the protection of intellectual property rights (IPR). Project participants have established strong lines of communication, developed new networks of knowledge, learned new methods for research and development and other business practices on a global scale. They have achieved success in savings, increased sales, decreased costs and increased productivity. Project results have allowed manufacturers to reduce raw material waste, reduce loss of finished goods, reduce the use of hazardous materials and decrease energy consumption.

For example, IMS can be a relevant source of inspiration to set up similar programmes outside manufacturing industry. That is one of the aims of objective VI of the third research project proposal.

3.3 *Technological university and arts dialogue*

Florida (2005) divided people into the 'creative class' and the 'service class'. Arts people are now seeing art (similarly to scientific research) as a process of creative problem solving. Also, the artist's tasks in the period of apprenticeship are similar to the engineering's tasks: to build a body of work procedures and the skills and the sensitivity needed to produce, and get that production known and accepted (a kind of peer review). The recruiting procedures for engineers under the framework of outsourcing might perhaps also become closer to artistic

recruiting, made by intermediaries (agents and dealers) having a gatekeeping function for young talent. That is to say, a starting point to find common ground for a true dialogue on the actual major issues and new ideas between the engineering and the arts communities, has been found.

The so called 'creative industries' comprise a large variety of fields, from heavily commercialized ones, such as advertising and marketing, broadcasting, the film industry, the Internet and mobile phone network provision, the music industry, print and electronic publishing, and video and computer games, to the traditional fields of the visual arts, the performing arts, museums and library services. This sector, linking engineering with the arts, humanities and economics, can also make a significant contribution to the 'knowledge-based' economy as it is knowledge and labour intensive and fosters innovation, with a big potential to generate employment for the 'creative class', as well as for the 'service class', and export expansion. The book *Towards knowledge societies* is recommended as further reading (http://publishing.unesco.org/details.aspx?Code Livre=4400#). It should be stressed the potential importance of the 'creative industry' in the three research project proposals too.

3.4 *UI and the development of civil society*

Today most multinationals claim that they see themselves as international corporate citizens. They seem to be striving to be good corporate citizens. They do this by adhering to the principles of sustainable development and rendering service to the community.

What about the image of the technological university in civil society, is it being properly addressed and promoted?

3.4.1 Double Eurobarometer survey 2005. In June 2005 the EC published two surveys with overlapping themes, *Europeans, science and technology* (S&T) (2005) and *Social values, science and technology* (S&V) (2005). The magazine *RTD Info*, on European Research, in November 2005 published a special Eurobarometer issue (available online at: http: europa.eu.int/comm/research).

Quoting the editorial of the *RTD Info* special issue: "We find, for example, that Europeans still believe in science progress. 88% of them consider that science and technology have brought improvements to the quality of life of people of their generation, while 76% believe they will improve the lives of future generations too. Another result is both positive and surprising: the increase in science knowledge in nearly all the EU Member States, in contrast to what many scientists and politicians would have us believe. It seems we are scientifically more cultured that we think! But there are nevertheless some less positive findings. In particular, the resistance of Europeans to certain areas of 'progress' such as genetically modified foods, cloning and even certain information technologies accused of destroying more jobs than they create. The situation is admittedly complex, given the many national 'peculiarities', genuine contradictions and apparent paradoxes revealed by this new Eurobarometer that is already generating a great deal of interest all over the world. It is a complexity effectively summed up by one senior US official when he learned of the results: 'People understand science and technology better than we think, it's just that they don't want what we are giving them'."

3.4.2 TIK engineering/journalism needs and opportunities. The above quotations seems to indicate that it is perhaps not enough for the engineering community to run workshops in schools, to organize science festivals and write books for the layman (although it is extremely important to continue these). Indeed, many of the really important issues for

society are TIK engineering issues involving engineering as well as many other knowledge communities inside the UI. Their efficient communication with society in general is also a TIK engineering issue. It involves the engineering and the journalism communities. A starting point to finding common ground for a true dialogue on the actual major issues and new ideas between the engineering and journalism communities has to be found. The TIK engineering and journalism courses advocated in section 2.2.5 could perhaps be an example of a serious starting point that in the long-term will greatly benefit both communities.

4. Conclusions

Several sources described in this paper, including data in *Eurobarometer 2005* (2005), published in June 2005, indicate that a 'bastion of globalization that can help globalize the world, in a positive sense' is needed and that the UI has the potential to help build it. The construction of such a bastion of globalization calls for research on strategic and monitoring planning to manage globalization and technological and scientific change. To properly manage this a more holistic view and a better interface across all relevant knowledge areas is necessary. The key role of the TIK dimension to address that holistic view inside the UI is shown. As a consequence of technological change, mainly in ICT, a new basic function for the UI (accepted by almost all inside the UI) has been identified and described, in section 2.1. The key role of the TIK dimension also in the UI's new basic function is shown.

At the UI level a need for education, research and innovation for long-term planning to manage globalization and technological and scientific change has been identified. The three proposals described above are an attempt to structure it. The first and third proposals deal with research and innovation strategies to help shape the TIK dimension and manage globalization and technological and scientific change. The second research project proposal addresses the issue of creating a structure to make higher education available to all through ICT and the enrolment of all concerned traditional universities. This includes research on efficient teaching/learning methodologies and tools and also root knowledge understanding and a common scientific language for non-science students.

For the three proposals the objectives, background, motivation, list of main research issues and leaders' profiles are given. A sample of inspiring TIK examples already underway world wide, is presented. Sponsorship of the three proposals does not necessarily seem to be the main obstacle. There are some global sources potentially available. Nevertheless, during the commencement phase the first and third proposals would fit quite well inside the European Institute of Research, to be created soon under EC sponsorship. Indeed the three proposals are tools to structure research and innovation in order to manage globalization and technological and scientific change.

Many other ambitious research projects can be envisaged, and it is hoped that the present paper encourages their appearance. For further discussions please contact the author by e-mail.

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