

THIRD MISSION OF UNIVERSITIES AND ENGINEERING

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The article embraces the study about the third mission of universities, designated here as the group of activities besides teaching and research. It addresses the engagement of the university in outreach activities with the imperative of contributing to society and the relationship with engineering. There are several ways to address this increasingly important dimension of universities' role and there are also different levels of political importance within universities. This is particularly important in engineering where there is a significant impact on the knowledge economy. The article intends to analyze and study the right degree of university independence within this framework without forgetting the involvement of stakeholders in these joint actions. For that purpose the continuing education in engineering activities represents areas that may be crucial in identification of the practices and case studies that can lead to an efficient and successful strategy.

Keywords: Continuing Engineering Education, Third Mission, Universities, Outreach

1. Third Mission of Universities

Traditionally, universities have been the place of research and production of knowledge almost apart from societal needs. In fact, universities were the leaders in knowledge that shaped the societal course of development. However, the significant changes that have taken place in the last 20 years of the 20th century have challenged this traditional view; nowadays universities and tertiary education, in general, are expected to broaden their perspectives and activities so as to respond to societal needs. Of course, the concept of societal needs is broad and often perceived as equivalent to economic priorities and research geared to the needs of the market. However, it also involves lifelong education, services to disabled students, connection with local communities, and widening access to higher education for disadvantaged and under-represented groups, as well as developing specialized services and model practices for coping with the problems of disadvantaged and marginalized groups in society. This broad conception of the relations of higher education with the society calls for a reconsideration of the role of universities and tertiary education in modern societies as active agents and partners in social change. Whether such a social role of universities is within their mission and what it entails for their functioning is an issue for debate.

Some issues are important for the third mission of universities. Such are (i) the role of universities and tertiary education in modern society; (ii) the implications of higher education assuming a social role; (iii) the active presence in the communities so as to widen the access of disadvantaged and under-represented groups to higher education; (iv) steering research, curricula, teaching methods, and services so that they meet emerging societal needs as well as of groups with special educational needs such as disabled students, foreign and international students, immigrants, etc.; (v) partnership with local communities so that innovative ideas and practices for the solution of local problems are provided; (vi) meeting the challenges of multi-cultural societies and globalization.

There are several ways to address this increasingly important share of universities role and there are also different levels of political importance within universities. Since the goal of the analysis aims at defining the proper strategy to engage the universities in this third mission, the article evaluates current activities in this area and their contribution to the third mission; it considers future needs and adequate procedures to adapt the universities; it evaluates the direct and indirect benefits of these activities for universities and for society. For instance, this is particularly important in engineering and technology where there is a significant impact on the

knowledge economy. The right degree of university independence is iterated within this framework but involving the stakeholders in these joint actions. For that purpose, the continuing education activities of engineers (CEE) and the internationalization of studies and of research represent areas that may be crucial to identify the practices and case studies that can lead to an efficient and successful strategy.

Knowledge management takes different forms within the evolving society and it is necessary to study the efficient contribution of universities. This third mission derives from the increasing importance of the social contract of universities with direct effects on transparency and accountability of the public institutions. It is, however, a strategic area for the development of universities and of society. It is important that evidence is produced that there is value for financing consumed in universities. The universities' economic and social impact on society can be evaluated and they are crucial in understanding what a modern university should be like. The knowledge is currently distributed among different partners and it is no longer an exclusive property of universities. There are informal responses of universities that have somehow adapted to this new pattern.

Could a short passage be added regarding the changing role of universities on a more concrete level that impacts society?

2. The Role of Engineering and of Technology

Within the scope of the third mission, or third stream, of the universities the possibilities for the engineering and technology take often the form of knowledge transfer activity. It is assumed by a great number of European universities that it is the major component, although intervening, to a lesser extent, in many others already referred to. This is particularly true for British institutions where in the late 1990s the government encouraged the institutions of higher education to engage in activities that could deliver community services as obligations, exploit knowledge outside academic environments and render higher education services according to community needs. The funding was, naturally, a major issue in this extension of services and several alternative ways were devised to face these increasing costs. One was through financing the local authorities enabling these to pay for the services; another was through the payment of a social premium to universities, and the third using private financing.

The private financing of the third mission was substantially based on the knowledge transfer activities. The forms that this knowledge transfer has taken were defined in twelve groups of indicators defined by the Russell group of universities. These indicators are:

- a) technology commercialization;
- b) entrepreneurial activities;
- c) advisory work;
- d) commercialization and use of university facilities;
- e) contract research with non-academic clients;
- f) flow of academic staff, scientists and technicians;
- g) student placements and internships;
- h) learning activities;
- i) social networking;
- j) non academic collaboration in academic research;
- k) active alignment of teaching with social and economic needs;
- l) non-academic dissemination.

The Higher Education Funding Council for England (HEFCE) has delivered more than seven million sterling pounds between 1999 and 2005 for the purpose of reaching out to business and to community. It represented about 2% of the funding for higher education but it is independent of teaching or research funding. The funding of the third mission is generally based on project-based schemes relying on the goals of economic development and the strength of the communities. Of course this prevented medium- and long-term planning and decisions have evolved to a more

permanent funding. This new scheme is organized in the UK as the Higher Education Innovation Fund of 2005 and it uses a formula based on measures of volume activity of each institution instead of competitive bidding of projects in specific areas.

The activities that relate to the effect of engineering and technology actors in society take different forms and a few are not easily considered as such. These may be lectures and seminars for policy makers, enterprises, industry associations and trade unions, interviews in media such as newspapers or television, participation in working groups organized by policy makers and by industry, participation in advisory boards, publishing debates and popular science articles, active discussion in political and policy arenas and dissemination of activities for policy makers. In effect, it is sometimes more relevant for the third mission to have university professors and researchers of engineering and technology engaging in common social events. This type of participation may have a more direct impact due to the immediacy of the intervention and the level of decision making than some other forms of so-called third mission activities can have affect.

3. CEE and the Third Mission

Continuing Engineering Education has been considered in many universities as a source of funding for other activities. These funds are either obtained through private investment or through social subsidies. A clear example of the questions related to the financing of CEE is shown in the reports and workshops made by the Working Group of CEE of SEFI (Société Européenne pour la Formation des Ingénieurs – www.sefi.be) in the last decade. These activities range from marketing to quality benchmarking of the CEE centers. Considering CEE a profit activity is probably a common situation among the CEE community around the world. However, there are cases where CEE is considered to be involved in the third mission of universities. This option of embedding CEE within the third mission of universities is justified due to the social and collateral benefits it may induce to universities.

Analyzing the social benefits of CEE implies measuring the consequences of economic growth and direct development created by the qualification and improvement of the engineering and technical community. In fact, the standards of development are simultaneous with the degree of qualification of the engineering and technological human resources according to the OECD reports on Continuing Education and economic development. It seems natural that the inclusion of CEE as a third mission activity seems natural from the point of view of contributing directly and indirectly to the level of societal, economic and civilization growth and expansion.

The funding and promotion of CEE through the third mission activities is also indirectly represented in the other effects. These are the transfer of knowledge directly to course participants, the acquaintance between teachers and active professionals, the participation of academics in practical sessions with industry applications, and understanding of the economic use of academic and research results. As a matter of fact, the dynamic interaction is fundamental to knowledge transfer, allowing the flow of information between academia and industry. In fact, the survey presented by the IACEE Working Group on University-Industry Relationship points out the following reasons for the role of CEE:

- a) CEE is envisaged as strategic by corporate management boards interviewed and needs are identified, actions planned and budget allocated.
- b) 60% of the firms interviewed have a Human Resource department that is in charge of CEE.
- c) The goals of CEE are to improve professional skills (96%), increase production (73%) and career management (33%).
- d) Lifelong learning is unavoidable but the motives for CEE are the impact of ICT (72%), transfer of technology (71%) and reengineering (64%).
- e) The most important points for CEE are content (88%) and course logistics (63%).
- f) The keyword for CEE is flexibility with tailor-made courses (80%) and face-to-face events (65%) being other relevant factors.
- g) The most important areas are Organizational Behavior, Management, Information Technologies, Sustainability, Quality and Environment.

h) The suggestions to improve cooperation are to personalize the relationship provider-user, to create efficient internal structures of CEE providers, to design tailor-made courses and to market adequately the CEE actions.

4. Case studies

4.1. Mathematics and Industry

The case study presented is sponsored by FASTS, Federation of Australian Scientific and Technological Societies. It is entitled the Australian Mathematics-In-Industry Study Group (MISG) and conducts workshops of one week addressing projects proposed by industry. Since 1984 there have been 17 workshops with 77 companies on 120 projects. One indicator of the acceptance of these cases has been that about 30% of the companies have registered for other workshops throughout the period of observation. These workshops were held at universities around Australia and New Zealand – the University of Melbourne, Queensland University of Technology, the University of South Australia and Massey University.

The idea behind these events was that small- and medium-sized enterprises can benefit from using smart solutions in qualitative and quantitative terms. These initiatives aimed at creating networks of firms and universities that would allow consultation and counseling. The expected results were the development of commercial research and qualification of the service provider. This would allow the firms to have access to research and advisory boards allowing rapid technology diffusion and improved productivity. The funding of this series of CEE workshops was in fact aimed at creating an opportunity for mutual acknowledgement of the universities and firms involved, anticipating that this would lead to future cooperation and mutual benefits.

4.2. Biological and Agricultural Engineering

The Engineering Outreach (EO) department of the University of Georgia, Athens, USA, has obtained approximately half of its funding from the state. The other part is paid by the beneficiaries of the EO program and is based on fees, grants or financial subsidies. The decisions of the center are autonomous in terms of deciding which programs or projects to run. The funding comes directly from the state budget and is given to the university but it is ear-marked for the EO. The EO works in cooperation with Georgia Institute of Technology (Georgia Tech) and other government agencies like EPA and Pollution Control. The areas targeted by the EO are basically Energy and Environment. The commission that decides the activities is composed of six stakeholder representatives that meet once a month. The yearly plan is decided by this commission. The EO uses, as support for own activities, the eighteen regional branches of Georgia Tech scattered in the state of Georgia.

The companies that work with the EO are small industries. The faculty assigned to the EO work with small industries to solve the problems presented. This type of work is considered tasks included in the academic duties since the involved faculty was admitted to perform those functions. There are about 150 engineers in the University of Georgia and these can also be called to work in the EO. The future will bring a decrease in state funding and therefore there is a tendency to increase the non-state budget. The activities are defined with a period of three days sponsored by the state funds and after that period the collaboration must be paid by the companies that required the services of the EO. The service has a high reputation of reliability and discretion that is defended by the center as a guarantee of future engagements. There is little continuing engineering education provided by the EO, and what exists is mostly engineer retraining or a workshop for the implementation of new systems. The quality evaluation of the PSO programmes of the EO is evaluated every month by a commission of three members from the University of Georgia, from Georgia Tech and from a related government agency.

5. Conclusions

The need for a strong and effective third mission of the modern universities is explained in this paper. This is motivated by the economic and social developments but also by a cultural change within academia and in society. There is increased accountability for universities from the part of society that demands a stronger participation of universities outside the walls of the universities. There is also a need to promote independent thinking and opinion making about the main issues concerning society, such as hunger, health, poverty, social unbalances, digital divide and conflicts. CEE plays an important role in this third mission of universities for direct and indirect economic reasons but it is also due to the social responsibility that universities have. The Aristotle phrase "Men by Nature desire to Know" is a statement and not a conclusion. CEE is, especially in the current era, a strong and effective tool to promote development in economic and social terms.

This intervention of universities can no longer be ignored by any part of society, public or private. The current situation implies that CEE should play a role in transforming the industrial and social qualifications enabling progress and improvement of the quality of life for society in general. Although considered a source of short-term financing for some universities, the impact of CEE as an investment on a short-term basis supersedes the possible advantages of being a profit activity. The third mission of universities is increasing the diversity of university services and improving the social importance of knowledge throughout the community. CEE is probably the activity that can have high returns on any investment made, either by the public or the private sector.

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Curriculum Vitae

Alfredo Soeiro: Degree in Civil Engineering from University of Porto in 1976, and a Ph.D. in 1989 from University of Florida (www.ufl.edu) as a Fulbright student. Pro-rector of University of Porto (www.up.pt) for Continuing Education (CE) between 1998 and 2003; founding member of Office of Continuing Engineering Education in the University of Porto (1997/8 – www.fe.up.pt), EUCEN (European University CE Network ,1992 – www.eucen.org); RECLA (Latin American CE Network, 1996 – www.cfp.upv.es/recla) and AUPEC (Portuguese University CE Association,1999 – www.up.pt/aupec); vice president of EUCEN (1992/8), vice-president of SEFI (2002/3 – www.sefi.be), president of IACEE (2001/4 – www.iacee.org), president of AUPEC (2001-2005) and president of SEFI (2003-2005); Academic Dean of Civil Engineering of University of Porto (2003-2008); main interests are engineering education, continuing education and on-line learning, focusing on networking, international cooperation and student evaluation; member of the Board of the journals European Journal of Engineering Education and of Higher Education Outreach and Engagement (2001-2006). Member of the International Hall of Fame of Adult and Continuing Education (2006) and EDEN Fellow (2008)