



IACEE

Working Group

Report for IACEE Tokyo Council Meeting

Theme: University - Industry Cooperation in CEE

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There were fifteen interested members that contributed in the email discussion group. This report reflects the work performed so far and it is desirable to include more case studies from different countries. The working group expects that in the near future additions and improvements are included contributing to a richer document for IACEE members and for the Engineering community in general.

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## A. Guidellines

The group proposes some guidelines for discussion at the conference in Toronto to improve this type of cooperation in CEE (Continuing Engineering Education) resulting from the analysis of case studies, literature and personal experience. These are divided into two groups with one related with University performance and the other with Industry approach.

- University Performance

- a) Knowledge of industrial reality
- b) Understanding the industry dynamics
- c) Acknowledging market changes
- d) Fulfilling schedules
- e) Rapid decision making
- f) Sufficient human resources



- g) Easy and frequent communication
- h) Competent and specialized human resources
- i) Adequate marketing of courses

- Industry Approach

- a) Identification of CEE needs
- b) Relationship of CEE and productivity
- c) CEE in the development strategy
- d) High technological level
- e) Professional development policy
- f) Internal evaluation of training
- g) Significant investment in CEE
- h) Cooperation with other companies and with universities
- i) Use of ICT for training

B . Recommendations

A survey of recommendations led to the proposal of thirty-one instruments to develop cooperation between University and Industry from FEANI Handbook 1999, pp 99-104.

"The first great step to strengthen the relations between universities and companies concerns the deepening of their mutual knowledge. However, the cooperation between university and companies does not only need one but several instruments:

1. Universities and polytechnic schools, or at least faculties and technology-related departments should have on their scientific boards, which have been transformed into scientific-entrepreneurial boards, distinct members of the business community who are sensitive to these issues.



2. Reciprocally, the entrepreneurial associations should have on their advisory boards or even on their general or management boards
3. Lectures, researchers or professors, specifically responsible for identifying cooperation opportunities and for advising as to better ways to establish that cooperation.
4. As it is impossible for the universities, polytechnic schools and research institutions to achieve high quality in all fields, they must choose those in which they can carry out research and give support most effectively. They must constitute centres of excellence within them and disseminate their capacities in the matters around which they are formed.
5. Universities should organise open days of their departments and laboratories to which they explicitly invite entrepreneurs.
6. Universities, polytechnic schools and scientific and technological research institutions should have technology transfer departments, which are evaluated according to the way they promote the absorption by companies of information and knowledge about products and processes to which they have access or that they have discovered and that can represent useful innovation for the companies.
7. Universities, polytechnic schools, research centres and technological centres must do marketing just like any company. The most adequate agents to carry out this function are the senior researchers and professors who have deep knowledge of all capacities of the institutions to which they belong and are less available for the permanent research tasks.
8. When several universities, polytechnic schools and research institutions exist in a region they need to form cooperation networks with each other so that they can take advantage of the synergies that can be established, so as not to be concentrated in the same area and but complementary in their areas of excellence, they develop, covering a varied range of specialities. It is obvious that their work will be rather limited in its consequences if there are no mediating operations, specially designed for entrepreneurs, so that they may know which support can be obtained from the nearest scientific community.
9. Students of universities and polytechnic schools should not receive their diploma without having a longer or shorter training period in a company. This training period should be at the end of the course and be accompanied by a tutor of their own university. Companies need to open their doors to the trainees and accompany them attentively, thereby investing time and effort in the future.



10. Scholarships are needed to support the recruitment of graduates by the companies. If they are recruited it will be an indicator that they have produced work which has been considered useful; if not the company and the trainees themselves have certainly acquired practical experience that will be useful, even if it is only to evaluate the technological and organization state of the business environment, detecting innovation opportunities.
11. Faculties and departments of high schools need observatories about the needs of the economics fabric in order to give them an adequate answer. The courses should be stable but the programmes frequently adapted so they can adequately meet those needs.
12. Technology-related faculties and departments should set up consulting bureaus responsible for answering any problems and providing consultations to companies. All the work should be paid but it has to be very efficient so that nobody hesitates to use the services. Prompt and valid answers or correct advice are necessary. Universities and research centres have to show to the entrepreneurs that they have capacity to solve their problems.
13. Technological infrastructures should be created associating universities, polytechnic schools, entrepreneurial associations, companies, technological centres and scientific research centres. They can assume different institutional forms. However, they need to be easy to manage, for which reason they would be a private nature or, if they are of a public nature, there must be administrative and financial autonomy. They must be totally responsible for what they do.
14. Information represents a strategic element of fundamental importance for companies. Therefore correct treatment and adequate presentation of the technological information of interest to the companies may draw the attention to opportunities and also to threats they might face. Universities and polytechnic schools might assume the responsibility of gathering , treating and dissemination such information.
15. Universities, polytechnic schools and research institutions need to publish practical information concerning new technologies, new products and new processes that they think might interest the companies located within their area of influence. Furthermore they should be available for giving competent explanations of the news for which they have been responsible.
16. The conclusion of the contracts programme between companies and universities, polytechnic schools and research centres need to become routine. They are an excellent way to make the latter scrupulously fulfill the deadlines and present result, and this is a first step in order for them to begin to follow the rules of the business world.



17. Universities and polytechnic schools should have specialists in drawing up and following up contracts with the companies. The clearness of the relations between them represents the basis of their success. On the other hand, contracts are the adequate instruments for defining the responsibilities of both parties.
18. Exhibitions should be organized periodically to display new technologies that might interest the companies of a certain region. This can be done through partnerships between universities and entrepreneurial associations, either sectional or horizontal. These technologies may concern both products and processes.
19. Secondary schools need to go towards a dual system or alternation training in the final three years (10th, 11th. And 12th. years in Portugal), beginning with students who wish to enter a profession earlier and those at the polytechnic schools or universities who already possess the knowledge of what a company is; this can only be advantageous for them and will later enable the establishment of bridges which that are not very easy. (It needs to be reminded that most part of the difficulties result from deficient communication.)
20. Universities, polytechnic schools and research institutions need to associate themselves with larger companies in order to carry out pre-competitive research, such as that recovered by framework-programmes supported by the European Union. Research institutions may then equip themselves with the most modern equipment and companies may keep pace with scientific and technological progress in certain areas, eventually endogenous some of the obtained results.
21. The partnerships mentioned above can also established with the State. They will be particularly adequate, for example, in the areas of health, road safety, fight against pollution, etc.
22. Universities and polytechnic schools should produce catalogues making reference to their capacities and largely disseminate them. Currently it is indispensable to have a web site with all the information. This does not dispense, however, with direct and personal contact with entrepreneurs. This is the reason why we have suggested other actions with a more personalized character.
23. There must be institutions specifically responsible for articulating and promoting innovation, namely through the connection between companies and scientific and technological research, as well as higher training institutions. In Portugal there is the "Agência de Inovação" (Innovation Agency).



24. Universities and polytechnic schools need to mobilize the networks of their former students in order to establish contact with the economic world. Today's life is facilitated by the creation of networks and the mobilization of its elements at the right moments and by the contact between networks as an individual always belongs to more than one. A publication of the alumni association with personal and technological news is essential. Also a good database of the former students and the places where they work is an instrument not frequently used so far but full of potential.
25. A system of support is needed for small companies that wish to make consultations of technological nature but refrain themselves from doing it due to potential costs involved.
26. Universities, polytechnics and research institutions should make available to small and medium-sized companies test and analysis services within their scope. (Obviously, large can develop their own means to do it). Where there is a lot of demand, some companies may make this the centre of their activity. If this is not the case, or if the demand is rather sparse, it will be called to the same advantage if these institutions assume responsibility for this kind of support. It is true that this is a routine task that is not incumbent to the university. But if there is nobody else to do it, it is better that the small and medium-sized companies find support in the existing institutions than no support at all.
27. The so-called horizontal technologies deserve particular attention, especially in regions with an economic fabric dominantly composed of small and medium-sized companies. Universities and polytechnic schools should organize themselves in order to disseminate these technologies and to draw attention to the innovations they are experimenting with.
28. The entrepreneurial associations, either partial or horizontal, should establish special schemes for stimulating the contact between universities and companies, particularly small and medium-sized companies. The large companies know how to take care of themselves. This support should include the detection of problems and needs that exist within the companies themselves through their associations. One must remember that confidentiality needs to be safeguarded.
29. The entrepreneurial associations should have a matchmaker role between companies and universities, after they know what the former can offer the latter. They will have to decode the language and make a first evaluation of the practical potential of the knowledge, the equipment, the products and the processes that universities offer.



30. The entrepreneurial associations, either partial or horizontal, should organize guided visits to universities, research institutions, technological centres and similar organizations, in which entrepreneurs and company executives should participate. The aim of this is to draw their attention to the available capacities for practical support to industry.
31. The sequence of innovations should be supported, with a view to a transformation in business, by venture capital or seed capital granted by the bank, through red-tape-free processes. This should aim at supporting new innovative companies: those that have as promoters young entrepreneurs recently graduated from university, innovative entrepreneurs, or industry companies executives who wish to put into practice a certain idea of the company.
32. Patent registration in the European Union is rather expensive compared to the United States and Japan. In order to compensate for this difference, European governments should offer financial support for patent registration, particularly when there are companies making those patents operational."

### C. Survey

A survey concerning this theme conducted between Sep 2000 and Feb 2001 involved 45 firms with more than 500 workers of the Northern region of Portugal and presented the following conclusions

- 1 - CEE is envisaged as strategic by the firms management boards and needs are identified, actions planned and budget allocated.
- 2 - 60% of the firms have a Human Resource department that is in charge of CEE.
- 3 - The goals of CEE are to improve professional skills (96%), increase production (73%) and career management (33%)
- 4 - Lifelong learning is unavoidable but the motives for CEE are the impact of ICT (72%), transfer of technology (71%) and reengineering (64%)
- 5 - The most important points for CEE are content (88%) and course logistics (63%).
- 6 - The keyword for CEE is flexibility with tailor made courses (80%) and face to face events (65%) being other relevant factors.



7 - The more important areas are Organizational Behavior, Management, Information Technologies, Quality and Environment

8 - The suggestions to improve cooperation are to personalize the relationship, efficient internal structures of CEE providers, design of tailor made courses and market adequately the CEE actions

#### D. Transcription

(from the paper "Lifelong Learning for the Global Networked Society" by Graham Guest presented at Trend 2000: Crossroads of the New Trend)

#### Lifelong Learning for the Engineer

For one profession's approach to lifelong learning we can turn to the European Society for Engineering Education (SEFI). SEFI has issued a discussion document (Padfield *et al.*, 1998) with the intention of stimulating debate on professional education and lifelong learning for engineers. The SEFI working group on lifelong learning and continuing education in engineering says, "It is one of the primary understandings of lifelong learning that an individual must possess certain "lifelong learning skills". A fully effective "adult learner" is able, fluently and without external direction, to:

- audit and assess what they already know and can do
- work out, at a level of detail that will differ from individual to individual, a career and a learning development plan
- integrate, into their learning, acknowledgement of their need for continuing *personal* development in the private as well as the professional realms
- understand the qualities of different kinds of knowing, of understanding, and of skills and competencies; how the different kinds of knowledge inter-relate and reinforce each other
- reflect upon their knowledge, establishing links between different kinds of knowledge, and formulating relevant theoretical constructs to explain it
- conduct research into elements of professional knowledge, practice and competence that lie within the context of their work, in pursuit of solutions to "problems of the day", personal professional development, and (more generally) the development of their profession."



## A Possible Future

Just as the traditional roles of universities and colleges are being questioned, so the learning future that I envisage will present strong challenges to professional institutions. Such institutions will, I believe, need carefully and critically to examine their roles both as qualifying bodies and as learned societies. On what basis are they conferring their qualifications and titles and should they move away from the role of learned societies, primarily serving their members, to become learning organisations with a much wider range of stakeholders?

The new worlds of work and learning offer each of us positive challenges to co-operate with others to reach beyond the old paradigms of command and control. This paper deliberately raises more questions than it answers and, as a way of offering more food for thought and discussion at the workshop, I end by presenting the following as a possible scenario for the future.

- All learning will be lifelong learning. It will be our own individual responsibility, undertaken with help, support and guidance from our coaches, mentors, colleagues and other fellow members of the networks to which we belong.
- In the new learning society we will be neither dependent nor independent, but interdependent, pursuing our learning and development in all manner of ways, acquiring new skills and knowledge as we need and want them.
- Our learning will be formal and informal and the artificial distinction between professional and personal development will disappear.
- We will be skilled at learning how to learn, accessing new information and seeking out new sources of knowledge, using information and communications technologies (ICT) where appropriate.
- The traditional university and college will be subsumed into a global virtual learning network including large companies as well as small and medium-sized enterprises (SMEs).
- Our learning and development will be demonstrated not in terms of qualifications but by means of personal portfolios, open and accessible on the internet.
- The 'job', as we now understand it, will disappear and our work will have new meaning, being seen as a source of creativity and personal fulfilment.
- We will be members of increasingly inter-related global networks for work, learning and development.



- Lifelong learning will be the key to survival and prosperity in the new knowledge-based economy.

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