

# The Importance of an Opening to the International Scene in Nancy's Ecole Des Mines' Strategy

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## Engineering Training Programs Faced to the Evolutions of Their Environment

Training programs given out by engineering schools must answer to evolutions in world economics [1]. This training must primarily take into consideration the emergence of new poles of production and of consumption (the opening up of Europe to the East, Asia and South America). It must deal with the appearance of new types of demands and finally with the growing complexity of institutions.

Current geopolitical evolutions manifest themselves by worldwide exchanges as well as by the domination of a liberal economic system. If Asia, on one hand, seems less attractive than it did by the past, because of its well-known problems, Europe, on the other hand, offers a potential market of over a billion people each with considerable and diverse needs and demands. It is also to be noted that an important part of South America is now entering its phase as a consumer society. Industries must therefore offer adapted solutions, both in price and in nature, to answer the diverse demands in terms of consumer goods or cultural exchanges. Thus, future Engineers will have to have superior capacities and skills in terms of research, innovation and productivity.

Qualitative evolutions of demand are also very important: new activities concerned with ecology, information, dietary needs and health are appearing. Service industries are employing more and more engineers which tends to prove that industrial culture is gradually reaching every economic domain: our world is not entering a post-industrial era but rather a neo-industrial one. This era is characterized, for all activities, by a generalized use of rationalization techniques developed by traditional industry during this century. This realization justifies the fact that it is important to develop engineering training programs, but it also implies that different profiles, adapted to the diversity of activities, be defined and established. In parallel to classical veins, such as mechanical, electrical and civil engineering, is going to appear a whole new generation of engineers. Their main quality will be their ability to have a multidisciplinary approach of the problems encountered. A single individual is often incapable of handling alone the growing complexity of organizations. The new engineer will have to be able to bring together the skills necessary to analyze situations: he will be Project Manager. Then, he will be faced with the multiplicity of parameters which set the evolution of the systems (whether they are economical or not). He will only have parcels of information to justify his

decisions. He will also have to find this information in data banks and treat it with statistical and computerized tools, which he will have to be able to master. His qualities as a manager will depend on how he will be able to master "scientific" techniques. Scientific management is one of the new strong themes of our training programs. Finally, since the actors of the internationalization of exchanges must know some languages, engineering schools must develop bold policies concerning not only the apprenticeship of the languages in themselves, but also the development of students' awareness of foreign cultures.

Research and training can not evolve when faced to all these evolutions. Engineering training must thus create new strategies, build new alliances and must develop its own industrial logic in order to meet the new laws of demand of current economics.

## Nancy's Ecole Des Mines (EMN): Its Positioning, Its Assets, Its Limits

After World War I, for reconstruction's sake and in order to highlight the newly reconquered territory, it was essential to create engineering training programs so as to be able to exploit Alsacian and Lorraine subsoil. EMN was created in 1919 and, since then, it has always continued diversifying its training programs and its educational methods so as to always be able to meet ever evolving industrial demands. If, today, we sum up the final objectives sought for in the training of an engineer of this school [2], we can come up with 4 major goals:

- to acquire and be able to develop skills in technical and scientific fields, to develop a scientific "attitude" (rigor, abstraction, a critical mind, doubt...), to know how to adapt one-self in a rapidly evolving technological context,
- to develop methodological skills and to know how to apply them especially out of the usual technical and scientific context (knowledge of different forms of reasoning, of methods of modelization and simulation, of evaluation and validation models), to apprehend the concrete, to master the main information and quality methods, to know how to evaluate and manage risk, and, to know how to build and carry out a project,
- to know the industrial world and its companies and, to discover the complexity of both organizations and socio-technical systems, to apprehend the complexity of

our contemporary world and to be able to open up to this world thanks to a cultural and humanistic approach,

- to understand, manage and develop one's own potential, to know how to communicate and to interact with one another.

The school features and carries out 2 main tasks: training and research. There are 350 students spread out on 3 school years following the Mines' Civil Engineering training program. In France, students can either enter University or special preparatory classes which train them for the competitive examination which one necessarily needs to pass in order to enter this kind of Engineering school (2 beforehand years of schooling). Most of the students taken into EMN come from the examination channel at a level which ranks the school as one of the first 10 French Engineering schools [3]. There are, nonetheless, a few places available to students coming directly from University (most are French). In parallel to this, 150 students finish their training on both a doctorate or a specialized diploma training level (Masters, DEA, Thesis...). Training is given out by full-time teachers-researchers and by outside contributors coming from companies. The school holds within its walls, or is associated to, 6 research centers which are dependent of the CNRS (for instance, the CIM, Material Engineering Centre, bears a potential of 80 researchers, 60 technicians and 60 PhD students).

The school shows many assets:

- A ranking in the first group of the great French Engineering schools (Grandes Ecoles Françaises). This is due to the competitive examination for the recruitment of its students. This examination is common to that of the Ecole des Mines of Paris which assures a guaranty of quality and notoriety thanks to the reputation of the "label" Ecole des Mines,
  - strong relationships within the industrial scene,
  - strong bonds with the University : EMN depends of the national Ministry of Education contrarily to other schools, which depend of the Ministry of Industry. This has enabled the school to associate its training to an important research activity (many laboratories are mixed research units: National Education / CNRS Centre National de Recherche Scientifique, National Centre of Scientific Research),
  - it has always been considered as a pioneer in terms of innovative educational means.
- Unfortunately, the School shows some weaknesses:
- it is too "small" compared to foreign competing establishments,
  - it is unknown on the international scene of engineering training programs,
  - it offers too few specialized training programs,
  - if one does not consider traditional Engineering fields , the range of skills it offers is too restricted,

- its organization and its reactivity are inadequately adapted to the demands of international competition.

The school's future seems threatened. This is not mostly due to a decrease of managing needs in industrial activities (the conquest of new markets could halt this decrease) but rather to a regression of the school's notoriety on an international scene which demands excellence and a critic dimension. Nonetheless, the school has certain opportunities left: there is an increase of demand for Engineers who could be both managers and contractors to help out on the complexification of current economic activities. Demands are arising from certain highly developing geopolitical zones.

## EMN's Development Projects

EMN's main goal is to keep on being one of the leading schools of the "Grandes Ecoles Françaises". To be able to keep this position, it has to continue improving the educational model, which has made its renown. It has to be innovative on both an organizational and a strategic level. It has to increase and diversify its research potential, to establish strong bonds with some important industrial groups and Universities and to develop new training program by opening outposts in the French regions where the skills required are the most found.

Finally, the school has to acquire its place on the international scene. Why so? Because the education market in itself is becoming international. Students and teachers both make their choices in Europe or all over the world. To meet the company's demands, those who make their recruitment international ones, training establishments who want to keep up their notoriety have to inscribe themselves in an international logic. Those who will continue limiting themselves to a regional development will end up working for the others.

To reach this goal, EMN has to welcome and train European students in both initial and specialized training programs. It must also be present, with its industrial partners, in the regions showing important development. It must moreover promote, in foreign countries, the engineering model described above not only to offer training programs, but mostly to meet the foreign groups' demands on these kinds of engineers. The process currently followed to reach these goals is described in the following lines. By 2003, the school's aim is for the number of foreign students to pass from 5% to 25%. It is also to be able to offer, thanks to partnerships with foreign universities, "double" degrees. Finally, it wishes to reinforce foreign work terms and to impose to its students the knowledge of at least 2 foreign languages.

## Cooperation with Brazil

Considering the good level of integration of different cultures inside the EEC, one can estimate that a French

Engineer working in Germany or in Great Britain will not be considered as an expatriate. The opening up on the international scene on which we should thus progress would take mostly into consideration what we would call "emergent" countries. France must help the training of the Elite coming from the countries where it wishes to show an economic and cultural presence. EMN considers that South America should become a privileged partner since not only does it bear a Latin culture but it also offers a great potential for development. Because of the limited funds it is granted, EMN has concentrated all its efforts on a single country: Brazil. In fact, Brazil, which shows the most economic potential for development in South America, represents, with China, one of the most important economical stakes of the third millennium. This country has found a political stability and has learned to curb its inflation. Natural resources are considerable in Brazil and its ports export all over the world. Its interior market is tremendous. Mass consumerism, as is it defined for highly industrialized countries, is developing. The new South American Market, Mercosul, will be brought to be, at its term, one of the most important markets on a worldwide. At a time where our economy is somewhat having problems finding a sufficient level of growth, we should certainly look into these markets. French experience, excellence and know-how will surely be appreciated.

In our case, the training of engineers, we have 2 primary goals: on the one hand, we wish to welcome Brazilian students, either for initial training or for in-service training in the case of qualified engineers. On the other hand we wish to send our students on work terms in Brazil so as to help them learn how to look for work on foreign markets. Financing for these exchanges is more difficult to find for Brazil than for countries of the EEC since student mobility in Europe is helped and simplified with the granting of community funds. Other forms of co-operation had then to be thought of.

We thus built a three-party co-operation consisting of: one French firm, having needs for training before recruitment based in Brazil, one Brazilian University who will be able to select its best students and the EMN. The student's education as well as his living costs will be paid for by the firm. Contacts with Brazilian Universities were mostly made thanks to research carried out in EMN's CNRS laboratories. This research was funded, personnel-wise by CAPES / COFECUB intergovernmental agreements. It is to be noted that the durability of such a co-operation will depend on that of research co-operations since both are very much linked. The selected student will have obtained 70% of the required credit for his initial diploma in Brazil. He will then be admitted into 2nd year of EMN for a 2-year period. At the end of the first year, a jury will decide on giving him tenure. At the end of the second, it will decide upon giving him the EMN Degree. His schooling results will then be transferred to the people responsible for his education in his original University. Depending on the

results he obtains in France, he will then be able to have up to 2 degrees.

The student will follow three 6 month terms where he will study the subjects he will have chosen with the firm paying for his studies. He will follow 2 work periods in this company (2 months in the summer and 5 months at the end of his studies although it would be preferable that at least one of the work terms be followed in an anglophone country). His being at EMN makes it possible for us to judge of his level in sciences, of his human qualities and of his level in foreign languages (he will study 4 hours of English per week). Finally, the end of year work term will enable the firm supporting the student to find extra elements of appreciation concerning him.

## Conclusions

EMN considers that it can play an important role in cultural and economic exchanges with Brazil. Internationalising its recruitment will surely boost the development of EMN's notoriety. This will enable it to continue to reinforce its bonds with leading industrial groups.

## References

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