

# Questions to Dr. Carmen Andrade, Directress, Eduardo Torroja Institute for Building Sciences, Madrid, Spain

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Dr. Andrade, thank you very much for the opportunity to interview you on the topic of technology transfer. Specifically, I would like to discuss with you the Spanish experience and your cooperation within the European Union and with South America.

**Question:** Would you be so kind to describe the function and philosophy of your Institute. What are your primary goals?

**Dr. Andrade:** The Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc), in short Instituto Eduardo Torroja, is one of the establishments belonging to the National Research Council of Spain (CSIC). CSIC institutes are primarily devoted to advanced research, either basic or applied. Our primary function is therefore very similar to that of university professors, although we typically do not have teaching assignments; the secondary goals include technology transfer and postgraduate education. Our individual professional achievements are evaluated by the excellence of our work, including publications, lectures, participation in committees, development of standards, and so on.

The CSIC comprises about 90 different institutes located all over the country. It employs about 7,000 people, of which about 2,000 have Ph.D. degrees, and the rest are junior researchers and support staff. The Institute of Construction Sciences, which I am leading, is one of the most applied and less basic of the CSIC institutes. Its activities are closer to the frontiers of industrial applications and, therefore, we produce a comparatively smaller number of publications when compared to other CSIC institutes. This is due to the characteristics of the construction sector to which we are related. We employ a multidisciplinary group of spe-

cialists in the fields of construction materials, structures, and building physics.

In summary, the IETcc—named after its founder Ing. Eduardo Torroja—is at present an institute funded by public and private sources. We have contracts with the construction industry and perform research projects upon their request. Additionally, we have a Department of Quality Marks through which the quality of numerous industrial products is tested and/or technical agreements are produced. Finally, most of our researchers participate in standardization bodies, helping in the production of standards at both national and international levels.

**Question:** What are the forms of interaction with other European construction establishments, and what are the goals and mechanisms of the knowledge exchange?

**Dr. Andrade:** There are several all-European cooperative networks involving national building research institutes. Let me mention only two of the most relevant ones. The one created first is the European Union for the Technical Agreement in the Construction (UEATC). It was funded in 1960, before the establishment of the European Community. Several institutes from different countries decided that it was time to set up a network that would oversee the mutual recognition of the test procedures used, experimental results obtained, and reliability/confidence in the qualification. They created what is known as the technical agreement, which delivers documents for innovative products or systems. In order to achieve coordination, the institutes agreed on and published the technical guides for the testing and evaluation. This procedure enables recognition of the evaluation by the "producer" country without repetition of testing in the "importer" country. It also serves to qualify innovative products without standards. At present, UEATC has 15 members; Hungary and Poland

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are already full members and Rumania and the Czech Republic have applied for membership.

I would like to underline the successful promotion of technology transfer via the technical agreement by excellent theoretical planning and methodology. The agreement deals primarily with innovative products and promotes increased export-import by eliminating barriers by means of agreements and mutual recognition between the involved national research institutes.

The methodology of technical agreements is now being followed by other geographical regions, and similar systems are now working in Canada, Japan, Australia, Israel, and the United States. Very recently, a preliminary agreement has been reached among participating bodies and institutes having the same philosophy, and we are now planning to create the World Federation of Technical Approval Organizations (WFTAO), which could be in the future the world network of building research institutes. Although this is still in the future, the global world market and trade will perhaps force us to accelerate the spontaneous cooperation that is now beginning to emerge.

In addition, the technical agreements procedure has now been adopted by the European Union through the newly created European Organization for Technical Approvals (EOTA). EOTA comprises the same institutes as the UEATC but is driven directly by the European Commission. Perhaps this is the reason why EOTA has not delivered until now a single European technical approval (ETA), while the same institutes within the UEATC did.

Another important European network is the recently created European Network of Building Research Institutes (ENBRI); it is devoted to the exchange of experience and is a vital link between institutes related to our European dimension.

Finally, I would like to mention that research itself enables continuous contact with researchers in other European countries. In this respect, the funds available from the European research programs for teams of universities-research centers-industry (BRITE-EURAM Program) have strengthened the connections and are establishing a real science community at the European level. This is, in my experience, one of the most effective ways of achieving the two main aims, namely the creation of a research of European dimension and the establishment of methodologies for effective transfer between research and industry.

**Question:** Would you be so kind as to specifically comment on the issue of European standards and their importance in intra-European technology transfer?

**Dr. Andrade:** I have already mentioned how important are the technical agreement documents delivered by

UEATC and those documents to be produced in the future by the EOTA. This methodology has already been proven to improve the safety and durability of the products or systems and to promote intra-European exchange without technical barriers. It will, perhaps, enable accelerated world trade in the near future.

However, in contrast, development and use of European standards is until now very slow. The traditional involvement of producers, users, and governmental administrations in standards development has proved to be a very important way of achieving consensus, but it is usually a very slow process. Therefore, although numerous standards committees are now working very actively, the number of standards produced is comparatively very small and not even the so-called "harmonized" standards have been produced thus far. However, I would not like to transmit a pessimistic view of the standards work, because we will see the important results in the future. The meetings of the committees enable a useful exchange of views and improve personal relations and technical communication. The real results will be surely visible during the next generation. We have to recognize that building closer ties and co-operation between countries not having the tradition of working together will take some time.

At present, the exchange of information and cooperation is taking place mostly through the initiative of the markets and industry, sometimes in spite of the existing national standards.

**Question:** Spain has historically very good relationships with countries in South and Mezzo America. What sort of interactive projects are you pursuing and what proportion of these cooperative actions is actually technology transfer related?

**Dr. Andrade:** We have several possible ways of cooperating with the Iberoamerican countries (the countries from Mexico to the south). Let me mention first the Instituto Iberoamericano de Cooperación that gives us the opportunity for the exchange of students and professors by awarding grants and travel/accommodation funds. Such support is available not only in the area of research but also in many other activities.

However, the most important initiative taken in the past years occurred during the celebration of the 500th anniversary of the discovery of the Americas. A special program named CYTED (Program for the Development), specially devoted to promote research exchanges, has been introduced and funded. In parallel, another program involving industrial partners (named IBEROEKA) was also organized. More than 20 specialities are covered under this program, enabling exchange between Spain and Portugal and the research community of the Iberoamerican world. My institute is

involved in two specific initiatives: 1) low-cost housing and 2) corrosion of steel in concrete. I am involved in the latter initiative. The network is named Durability of Rebars (DURAR). It involves 10 countries, and we are in the process of producing a manual for the inspection of structures exhibiting corrosion. This will enable us to use a common procedure for inspecting corroding structures.

In addition to the research itself, the IETcc has had many educational exchanges with Iberoamerican countries. Since 1960, the IETcc has organized a Master course, named CEMCO, every 3 years for architectural and structural engineers. The length of the course is usually about 3-4 months. We plan to organize the next one for 1998, and we expect participation of about 30 professionals. The course will deal with the issues of advanced materials and structures.

**Question:** What are the most effective methods for implementation of research results in industrial practice? What are the main challenges?

**Dr. Andrade:** Experience shows that the time needed for an innovation to be implemented by the construction sector is usually long. Therefore, in my opinion, the research has to be strategic because the investments are not recouped in a short time. With this in mind, there are indeed several effective methods for implementing research results, one such approach being governmental support of joint research-industry projects. As I mentioned earlier, this is now done by the European Union.

However, the ability to innovate must remain the responsibility of the construction industry itself. Individual companies need to be properly structured to enable commercialization by shortening the time between completion of research and its implementation. Admit-

tedly, there are numerous challenges to overcome, primarily due to the conservatism of the construction industry. I believe materials producers are the most innovative at the present time.

**Question:** Could you share with our readers your experience with successful, or unsuccessful, transfer of research results to engineering practice? What are your recommendations for increasing the probability of successful transfer?

**Dr. Andrade:** An example of successful technology transfer is the portable corrosion-rate meter developed on the basis of our research several years ago. The idea of using the developed knowledge in an instrument was suggested by the research; this was followed by identification of a suitable company and joint development research. Today, the instrument is known worldwide, and the technique is used to calculate residual service life of corroding structures. The main challenge was to develop a common language between the researchers and the company.

There are numerous examples of unsuccessful transfer; allow me to avoid mentioning any one in particular. However, in my experience, the most common problem is incorrect or inadequate identification of real market needs. University researchers have new ideas, but the problem for the industry is to transfer these innovative ideas into economically viable businesses. Therefore, the key is to understand the market needs, then to find appropriate solutions to the outstanding technical problems, and finally to commercialize by the industrial partner.

Dr. Andrade, many thanks for your time and great hospitality. Your views will be much appreciated by our readers. Thank you again.