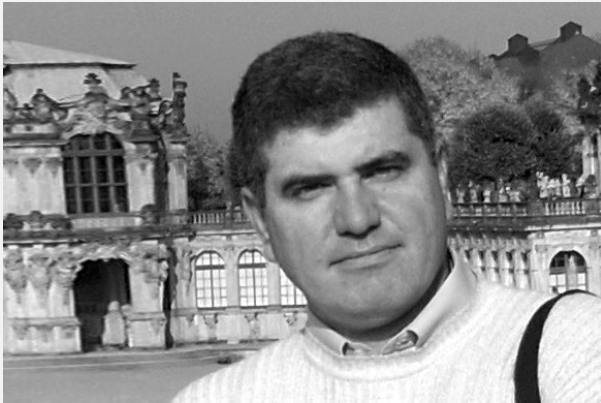


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PARTICLES FOR SOCIETY

Interview with Ezio Previtali, coordinator of the INFN National Committee for Technology Transfer (CNTT)

Promoting and strengthening technology transfer activities is one of the areas on which INFN has been strategically investing for some years. Since 2012, it has set up the National Committee for Technology Transfer (CNTT), with a dedicated Office, and it has launched several projects, the most recent being R4I (Research for Innovation). We spoke about this with Ezio Previtali, coordinator of the CNTT.

What is meant by technology transfer?

'Research turns into innovation when it exceeds the social threshold', this is how one of my professors described technology transfer. It's a process through which knowledge, technologies and prototypes, which are developed by research institutions for scientific purposes, are made available to the market and society. It's an important mechanism, and sometimes we do not realise how intrinsic it is in what we do. Technology transfer has by its very nature an interdisciplinary aspect: we develop a product that is used for high energy physics and we apply it to medicine, for example. It's a very satisfying activity because, in order to achieve our scientific objectives, technologies are pushed to the limit, to then be transferred to other areas, which can benefit from them but where it would have been difficult to develop them.

What does the Committee that you coordinate deal with?

The CNTT is a steering structure that supervises technology transfer activities. We try to facilitate INFN's capacity to add value, where by adding value we mean the protection of intellectual property, patents, support for research ideas that can evolve into innovative projects, translating a prototype

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into an object that can be industrialised. Another important aspect that we take care of is the transfer of know-how, which we also try to make available to industrial partners. The CNTT also coordinates the network of local contacts and manages activities related to the support of research groups and laboratories.

How does technology transfer work at INFN?

There are two basic mechanisms. The first is intrinsic in research activities. To develop the technologies for our experiments, industries work with us because otherwise they would not know how to do it. They hence acquire new skills and specialisations: this mechanism is called 'by procurement'. What is emerging in the world is that big science has a very high impact on industry, LHC being a prime example: its construction required technological innovation and the companies involved had a direct benefit. This merit is attributed to us: we conducted a survey with 200 companies and it emerged that those who worked with us started to develop new products and open up to new markets. In the case of technology transfer by procurement, the task of the CNTT is to bring out the process, which in itself happens in, a more or less, automatic way.

The second mechanism is the one in which ideas are developed in scientific groups and can then be turned into a product of possible interest to the markets. This is the technology transfer mechanism that, as CNTT, we follow more directly, because it is the one that requires greater support and is more related to relationships with companies. We ensure that innovative technologies for basic research become a driving force for the society in which we live: from technologies for research on the Higgs boson to machines for the treatment of tumours. When using public money, there is a duty to make the most of the investments, not only achieving the scientific objectives, but promoting economic growth and making what is produced available to everyone. Transfer to industry constitutes a great advantage, especially in the case of SMEs, small and medium sized enterprises, which in Italy are many, because an SME often does not have large resources to invest in R&D: in this way, we facilitate their growth and their competitiveness in the market, also internationally. A researcher must therefore also try to understand if there is something in the laboratory that can be exploited at the social level.

How can results sharing and patents be reconciled?

In Italy, the patent is often seen only as a means of protecting oneself: if someone wants to do something with my research, he must pay. In reality, the patent does not end with this aspect. Let's say that I develop a new idea thanks to a loan received, and that I thus obtain an innovative

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prototype. There are now two possibilities: either I publish or I patent it. If I publish, in principle, I have informed the whole world, and anyone can freely exploit my project. If I patent, someone has to negotiate the financial aspect with me. But this is a rather naive interpretation, often things work differently. What happens when a result is made public is that interested companies can take it and develop it, but this happens in a very competitive environment. It is clear that this is a huge risk, which only the largest companies can afford, because it means investing significant sums with very high risk capital to develop something they cannot protect, because it is known to all. This tends to minimise the investments of industries because they are less protected by a return on the investments. On the other hand, the patent offers an advantage: a company can invest a significant amount of capital having the security of having an advantage over the competition. So, it is not true that the patent limits, it often enhances the possibilities: so much so that there are cases in which a technology still in the embryonic stage without a patent does not make headway, because nobody is willing to invest risking a lot. Not all projects can be patented or the patent is not always the best way to give a chance to a technology: publication therefore remains a good practice, even if the patent does not exclude subsequent publication.

What are the main difficulties you encounter?

There is a cultural difficulty: many researchers still see technology transfer as a "distraction" from their main activities. What is required of researchers is awareness and willingness to highlight activities that may be of interest outside the laboratories. Another critical aspect is related to our nature as a public institution, due to which we are subject to sometimes very binding rules and regulations. An industry has different timing and ways than those of public administration: when innovation is made, the time factor is fundamental to be competitive. Then there are another two aspects, albeit more marginal, but still characteristic of a situation. The INFN has employees and associate university staff: this leads to difficulties in the management of intellectual property because it is often difficult to reconcile the regulatory constraints of both. We would need a more streamlined and clearer regulation. The last factor, very strange but we always bump into it: INFN researchers do not assign the right value to their technology transfer projects, underestimating what they produce.

What are the most interesting cases of technology transfer at INFN?

A very successful example is CHNet: the cultural heritage network focusing on survey technologies. Or the use of accelerators in the validation of space technologies. There are applications to medical physics: CATANA at the INFN South National Laboratories for the treatment of ocular melanoma

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thanks to proton beams (proton therapy) and the National Center of Oncological Hadrontherapy (CNAO) in Pavia.

There are also more specific activities. We have signed a large contract with an important international company, Waters, for the development of a mass spectrometer prototype. Another successful project is MID, a tool developed for thalassemia analysis. MID has recently been concluded, with the last certifications, and is available at the Galliera Hospital in Genoa. We are now aiming to start its mass production. In addition, we have sold prototypes for the analysis of radioactivity in nuclear plants under decommissioning, currently used by Sogin. They were developed in collaboration with Else Nuclear, a company that then produced the devices and put them on the market. We also have applications deriving from the use of muon detection techniques for the study of volcanoes or radioactive deposits in nuclear power plants. In addition, we support calculation projects for time optimisation in financial markets, for which we have developed activity and data (including sensitive) file management systems, etc. The last interesting aspect that I would like to mention, even though there would be many others, is the one related to spin-offs. Above all, the case of the small PIXIRAD that in 2017 was acquired by the Dutch company PANALYtical: in the success of this operation of the foreign sale of an INFN spin-off we must recognise the merit of the PIXIRAD researchers who were able to manage the negotiation with professionalism. Since last September we have also a new regulation concerning spin-offs, so we hope to make this sector grow even more. In short, INFN is working hard in order to ensure that the skills and knowledge, which for many years have remained closed in laboratories, become the heritage of society and can contribute to the economic and social development of the country. And this is starting to be known and recognised outside INFN: from January to date we have been contacted by three venture capitalists who have seen a possible innovative partner in INFN. Today, technology transfer at INFN invoices a couple of million a year, but we are working hard to make this sector grow even more.

INFN has recently launched a new technology exploitation project, R4I. What is it?

As CNTT we realised some time ago that there was a problem that mainly concerned interdisciplinary technologies. When a project is developed in Commission 5 [the National Scientific Commission of INFN which deals with technological research, ed.] one reaches at most the development of a prototype, that is to say a product not yet solid enough to be put on the market. At the same time, however, it is no longer justified as a research project. With R4I we have therefore created the conditions to support these technologies for another year, giving them the opportunity to become more solid. Usually, the prototypes have a Technology Readiness Levels (TRL) of 4/5 on a scale that

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reaches up to 9, representing products ready for the market and for society. We therefore support technologies, from both a financial point of view, with the proceeds deriving from technological transfer activities, as well as an infrastructural and administrative point of view. Our support can in some cases last a second year, without a financial contribution: in essence, the project has a year to reach solidity from the technological point of view, and then has a second year to get on the market. In summary, R4I is an initiative to support what we call 'last mile' projects, the mile that separates research from innovation. ■