Newsletter Interview

FROM A TOOL FOR FUNDAMENTAL PHYSICS TO A COLLECTIVE ASSET: CONCEPTION, DEVELOPMENT AND SHARING OF A TECHNOLOGY

Interview with Mariangela Cestelli Guidi, coordinator of the INFN National Technology Transfer Committee

From medicine to cultural heritage and environmental protection: knowledge and technological transfer, KTT, from the world of research to society is an activity with a wide and recognized impact, which is now considered fundamental, so much so that it is institutionally recognized within the Third Mission of Research Institutions and Universities, even for evaluation purposes. The INFN, which has always dedicated attention and commitment to KTT initiatives, has over the years prepared and implemented an increasingly structured strategy, which is based above all on the exploitation of innovative ideas and techniques born in the field of basic research, and which aims to facilitate and catalyze processes of sharing with society, understood both as the business world and as any context that could benefit from applications. This process ensures that new technologies are translated into goods and services that can be used by the community. Part of INFN's strategy is also clearly to build tools for internal evaluation and monitoring of KTT activities and products. To implement its strategy, the INFN has an ad hoc organization covering administrative-legal and scientific-technological aspects, coordinated by the National Technology Transfer Committee (NTTC), supported operationally by the Technology Transfer Service (TTS), which is in charge of the management and support aspects for researchers.

We spoke about the initiatives and opportunities born in the field of technology transfer with Mariangela Cestelli Guidi, a researcher at the INFN Frascati National Laboratories, who has been coordinating the work of INFN NTTC since 2022

What is the contribution that basic research can bring to society, in terms of the business and production world, and to the country?

Large experiments designed and built to answer questions in fundamental physics have a very high level of frontier technology. One of the challenges we face today, alongside that of advancing knowledge, is to bring these technologies out of the realm of research so that the benefit for society also translates into competitive growth for the country. This what Technology Transfer is about, defined as the set of procedures and tools necessary to facilitate and catalyse the processes that drive the exchange of knowledge between the research world and society, be it the world of business or any context that can be the recipient of applications. This process allows new technologies to translate into goods and services usable by the community.

Which INFN bodies are designated to support the external transfer of technologies developed within the scope of the institute's activities, what are their goals and initiatives, and the resources made available by the institute to encourage technology transfer and facilitate the success of technology transfer projects?

The INFN body that is responsible for identifying strategies for the exploitation of knowledge and making available the tools to develop it is the National Technology Transfer Committee (NTTC), supported by the Technology Transfer Service with which it works in close synergy, and which provides expertise on patenting procedures, definition and protection of intellectual property, support for the creation of academic spin-offs and relations with companies. In every INFN structure there is also a network of local contact persons directly coordinated by the NTTC who promote the scouting of new technologies and proposals coming from the researcher network.
Building successful projects does not follow a linear path and involves several players with different skills. Researchers are an active part of the process, but the system is increasingly being organised toward the creation of dedicated structures that deal with the many steps needed to bring research products closer to the market.
Among the strategic actions to support technology transfer is the "R4I - Research for Innovation" funding tool, whereby technologies developed within the scope of research programmes are selected to raise their Technology Readiness Level (TRL) and to be accessible to companies faster and with lower risks. The next R4I call will certainly see an increased focus on issues developed in National Resilience and Recovery Plan projects in which the Institute is involved and which envisage the participation of large industrial groups.

What kind of demands or needs can the activation of technology transfer processes that INFN is promoting respond to? What difficulties do they face and what activities are needed to ensure that projects get transferred from research to industry and to society?

Over the past few years, the joint and coordinated work of the TT's various structures has facilitated a significant increase in collaborative and third-party research initiatives conducted with companies, protection and exploitation of intellectual property, and support of spin-off creation. Through interaction with INFN, companies can access advanced technologies that they typically do not possess and are unable to develop on their own, or which are not part of their know-how or normal industrial and production processes. An important element to underline is the innovation that comes through procurement actions, as in the case where the technological modifications and adaptations required in the design of certain ad hoc developed products can be the basis for new products to be introduced in the normal industrial cycle, thus expanding the capability of companies to provide technology. Finally, in joint technology development, companies gain an advantage in

terms of cost reduction and risk dilution in R&D activities, linked to the opportunity to be able to experiment with alternative technological solutions.
The difficulties encountered in this process stem from the fact that we are aligning ourselves, at least a decade late, with existing European and international best practices, but there is still no real system in place to support research institutions in this process. For INFN, there is an additional difficulty because, unlike organisations that are directly engaged in applied research, we have to find a second-use for technologies developed for basic research, and this requires an openness to sectors that are not really those of our core business and related industries.

What is the nature of the entities representing the recipients of INFN's technology transfer activities, and to which sector do most of them belong, the public or private sector?

Although the main recipients of TT actions are companies, it is increasingly frequent that scientific collaborations are transformed into industrial contracts, in which INFN, in areas where there are no private competitors capable of doing so, acts as an entity offering a commercial service to other research institutions to design or manufacture high-tech components. Think, for example, to technologies related to accelerator physics, in which INFN expertise is bringing innovation to the field of radiation therapy, and through which companies participating in joint research projects acquire a huge competitive advantage in the market.

With the recognition of technology and knowledge transfer as a true mission of research institutions, the so-called Third Mission (after training and research), has the attitude toward these activities changed and, if so, how has it changed both within and outside the scientific community??

The attitudes is changing also thanks to comparison with successful models adopted by European research institutions similar to INFN. Undoubtedly, there is a need for an effort to raise the awareness of the internal scientific community, an effort that also involves the implementation of communication and training tools. On this front, in collaboration with the National Training Commission, we have launched a major training programme on Technology Transfer, consisting of both distance learning activities and multimedia educational content on the various topics of Technology Transfer on the web portal, available to all personnel on an ongoing basis.

What are the relationships between innovation produced by technology transfer, patents, and open science?

We are faced with opposing interests, that of the scientific community, to share research results as early and widely as possible, and that of industry, to control the dissemination of an invention, determining how it should be commercialised in order to obtain protections and profit.
It is necessary to understand, however, that for an innovative technology to have an impact on society, it must necessarily meet the rules of the market. The most direct example of this is the results in the pharmaceutical field, where the exercise of intellectual property rights makes it possible to put in place the necessary investments to accelerate knowledge transfer and reduce delays in the reuse of scientific research results, thus facilitating a faster process from research to innovation. To use an expression from a recent European Community study on this issue, research results should be 'as open as possible, as closed as necessary'.

Which sectors can currently benefit most from the technologies and expertise that INFN can provide? What are the most successful cases of technology transfer signed by INFN?

The main sectors are those related to technologies related to accelerator physics, such as electronics, superconductivity, precision mechanics, high-performance networks, imaging diagnostics, particle beam therapy, but also techniques applicable in the field of artistic-cultural heritage conservation and security.
INFN's most successful cases are relatively recent, but they already define a trajectory in which we excel in fields such as highly innovative radiation detectors that can contribute to social and economic development in the areas of digital radiology and industrial and scientific imaging. This is the case with the spin-off PIXIRAD, subsequently acquired by the Dutch company PANalytical.
Another large successful project is also the one involving Sybilla Biotech srl, a spin-off of INFN, the University of Perugia and the University of Trento, which has developed an innovative platform for the discovery of new pharmacological targets based on identification of the intermediate stages of the protein in order to prevent its folding and thus cause the protein to degrade Sibylla BT srl, following its growth path in INFN, benefited from a major investment by a financial company that placed it among the best start-up companies in the life-science sector.
Alongside these big success stories, I consider the ability to be recognised as a point of reference for particle accelerator technologies, where the market offers significant opportunities that I am sure will be successfully exploited, to be strategically important for INFN.

What could improve the impact of technology and knowledge transfer?

There is a need to develop a more effective interactivity model - that envisages appropriate procedures, organisational structures, internal skills and tools - in accordance with the Institute's declared mission, aimed at maximising the innovative effect of the knowledge produced. To achieve this goal, the institute has obtained a 2.5 million euro grant for the three-year period 2021-2024 from the Territorial Cohesion Agency, thanks to which the OPEN INFN (Open INnovation from Fundamental Nuclear research) programme has been activated, through which the skills of INFN's TT structures will be strengthened in order to optimise exploitation processes and strengthen legal skills for intellectual property protection and knowledge transfer management. The programme is extremely ambitious and will involve the Committee, the TT Service and the network of Local Contact Persons. This is a unique opportunity to acquire the skills and attract the resources needed to give the INFN TT a new look.