

## **Round table**

### **Working Together: Challenges in Institute–Academia–Industry Collaboration**

The round table opened with an intriguing statement describing money as the main driver not only in industry but also in institutes. When the latter encounter a new need, they mostly have to choose between in-house development, commercially available products and starting development collaboration with industry. The main risks that drive the decision are 1) not meeting the project deadline and 2) missing the performance specification.

Opting for in-house development maximises the potential of the two risks. On the other hand, in this way an institute can maintain control over a product and does not have to depend on an outside company. Some institutes would like to keep the key technologies in-house for long-term developments and long-term maintainability or operability. It is hard to imagine starting a large-scale project without first setting the test band, which serves to prove the principles and evaluate the prototypes. In the case of in-house developments, these are preferably based on a commercially available platform, which should be open (though not necessarily free of charge). The product resulting from such internal development is not always the product as industry perceives it: it can also be the proof-of-principle, number of publications or the intellectual property itself. Intellectual propriety rights can be managed through patents, NDAs or licence agreements.

This shows that institutes are eager to invent but at the same time are aware that it does not always make sense to reinvent the wheel. They may prefer to simply copy the proven solutions from other labs, which can also be based on commercially available products. The advantages of such products are guaranteed performance and functionality due to the ability of industry to industrialise prototypes and manufacture long series of completely equivalent units by effecting strict quality assurance and quality control. They are expected to be well supported by documentation and are sold together with warranties and technical support. Documentation writing has proven to be an activity “non grata” both in institutes and in industry, but in industry this is an indispensable part of the project. There is a common interest in starting collaboration, which can cover either the complete project or parts of it. One of the points when industry can enter is after the proof-of-principle phase. The most important stage is the gathering of the requirements: understand what is needed and why it is needed rather than jumping directly to implementation. Besides the functional and performance requirements, we should also consider the non-functional requirements, such as usability, reliability, supportability and scalability. The user should tend to break down the global machine specification to local specifications in order to reduce the related risks. If the user is a field expert, then together with his colleagues and network he can provide the detailed requirements needed for outsourcing. If this is not the case, it is better to write the requirements together with industry. In any case communication is the key word. It is recommended to break the project into smaller segments in order to more easily control and manage it through fast feedback. This is especially true when the requirements are not entirely known and/or defined. It is essential to manage the project risks by setting the priorities between scope, time and costs constraints. In such cases there is no need to add the “performance safety factors”, which only add to the costs of the project. Experience shows us that smaller projects are more predictable than big ones. If possible it is better to have several short development cycles and get the feedback soon.

Industry must earn money on the market to survive and grow, so it is reluctant to start critical projects and prefers to participate in developments that can be further exploited. Bigger companies are not interested in entering such collaborations, so institutes find it easier to work with smaller companies.

Gathering the requirements is vital in the very early project phase. Once the product is developed and available, its users expect it to also offer a simple application running on their (Windows) PC. This enables a quick initial evaluation without having to wait for internal software development groups to write the device servers. Compared to internal developments, industry can make the products cheaper. Unfortunately, the accelerator market is still too small to make industry really benefit from the economies of scale which would enable developing such user-friendly applications a priori and without hesitation.

Later on during the product's life-cycle, maintenance and obsolescence become important. In the past, most of the needed instrumentation was developed in-house, which gave users the feeling that they fully controlled it. They knew how the products (mostly analogue) were developed and built and were able to repair them themselves. However, even in such cases, sooner or later some components became obsolete and finally the system needed to be upgraded and the products replaced. Following this praxis, some institutes would like to get the complete documentation to be able to produce a product in case the company decides to discontinue it. The challenge remains how to manage obsolescence in a world of rapidly evolving digital technologies.

In summary: if the particular interest of the customer is strongly considered, then working together is a win-win situation.