Tying up loose ends for a quantum leap

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Quantum technologies have become the Holy Grail of the IT industry with research projects springing up all over Europe. Now a major effort is being made to spur development by adopting a coordinated, structured approach.

The field of quantum information processing and communication (QIPC) is still in its infancy in research terms, with the first groundbreaking papers only appearing about 15 years ago.

But since those early days, the field has shown such promise that it has become one of the most active of the natural sciences, which provide the framework for applied sciences including IT.

In Europe, the QIPC community is vibrant and thriving with dozens of institutions scattered across the EU involved in research and other related activities in the field.

Until now, though, there has been a lack of structure and coordination with no attempt having been made to get all the parties involved in QIPC research, educational and commercialisation efforts singing off the same songsheet.

Focal point for quantum activities

This is where the EU-funded Qurope project comes in. One of a special type of Coordination Action projects, as opposed to the more common research projects, its aim is to build out a Europe-wide infrastructure

which will provide a focal point for QIPC activities. It has attracted 35 partners, ten of which are actively involved in the project's work packages, as well as more than 100 research institutes which are affiliate members.

Project administrative officer Lukas Theussl says: "Qurope has one major target and objective and that is to define a common vision and a future roadmap for research into quantum information technology in Europe. We are structuring and organising the research community at a pan-European level and trying to organise funding that makes research and development sustainable in the future."

Designing the roadmap, which gives an overview of ongoing and planned research activity in Europe, has been one of the major achievements of the project, as has been the production of several other strategic documents. This work serves to provide both the European Commission and national agencies with guidance when it comes to funding research.

Truly enormous potential

Qurope has also been organising conferences, seminars and workshops to bring together not just academic researchers but industry executives who have an interest in what benefits the development of QIPC can bring to their businesses.

While some of the benefits are clearly understood and believed by researchers to be achievable, how the field will develop and what it will enable is the subject of much crystal ball gazing but difficult to predict with certainty.

"Where we are now is comparable to where research into transistors was in the 1920s, and trying back then to predict the development of today's personal computers from those early beginnings," Theussl points out. "It

is hard to say what the impact on society will be 20 or 50 years from now, but the potential is truly enormous."

Among the concrete aims of the research are to work towards a whole new breed of computers which are perhaps 1000 times quicker than today's machines, opening up a new world of possibilities both in industry and in personal computing.

Aiming for totally secure data

"We also hope one day to have developed a technology that will allow us to communicate in absolute security, so nobody has a chance of cracking your credit card or other private information," says Theussl.

Initially, this type of very secure communication will probably be adopted by governments and institutions, such as banks, where protecting data is of paramount importance.

Proof-of-concept research into this type of application is already underway, but Theussl says it is too early to say when it might be commercially adopted outside of high-security areas.

In the meantime, the project continues both to organise its own events and to bring QIPC to a wider audience by participating in IT fairs with presentations and stands. It is also reaching out to the wider public with non-technical articles in general magazines and popular science magazines. Part of the outreach programme has been a Young Investigator Award which was first presented in 2007 and continues this year.

Qurope has been funded under the Future and Emerging Technologies (FET-Open) initiative of the EU's Sixth Framework Programme for research.

More information: www.qurope.net/

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