International R&D at Oulu University of Applied Sciences – practices from Raahe

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Historical Retrospective

Computer engineering education in Raahe was established in 1972. Raahe Campus of School of Engineering is the oldest educational institution of such kind in Finland. The School of Engineering is a part of the Oulu University of Applied
Sciences (formerly known as Oulu Polytechnic). The university is one of the largest universities of applied sciences in Finland with approximately nine thousand students.

From early days of education in Raahe a practical implementation of graduation work has always been a part of an educational process. Students from Raahe used to work in companies or in educational and research laboratories of Raahe campus and solve real-world problems or develop engineering solutions for the needs of on-going projects. Such practices spread around Finland and now are an essential part of educational processes of any Finnish university of applied sciences.

A history of an international research and development work has started at the same time – as some of the students from Raahe were involved into international projects in those companies, where they did their graduation work. Sometimes students worked abroad in foreign companies. This type of international R&D was not collaborative. Teachers from Raahe campus who supervised students’ graduation work were just able to acquaint themselves with some of the international practices and R&D work of the companies.

When in 1995 Finland joined the European Union, new opportunities for international collaboration opened to all educational institutions in Finland within So-crates Programme activities, such as Erasmus project, and Leonardo da Vinci Programme. Aarno Meskanen, a headmaster of Raahe Engineering School that became to be the Raahe Institute of Computer Engineering in 1999, encouraged students and staff to utilize benefits of exchange programs. A first significant result of a staff exchange was a visit of German research center by Jouko Paaso and Pentti Koskinen and their work at Fraunhofer. Both of them started their dissertations and after a period of time obtained PhD degrees.

A first international R&D project in Raahe started at a beginning of 1998. An idea of the Active Self-Directed Learner (ASL) project was to introduce educational materials explaining a nature of energy, energy sources, and the use and saving of energy. A result of this work ready for distribution was published on a CD in a form of a multimedia content.
Educational institutions from four countries participated to ASL project: Germany, Netherlands, United Kingdom, and Finland. The project has also given great opportunities for students – to be involved into an international collaboration. Some of the students were involved for an entire duration of the project – three years.

A significant step towards development of international R&D in Raahe happened in 2001 when Pehr Brahe Laboratory (PBOL) started its operations. PBOL was founded by three organisations: VTT Technical Research Centre of Finland, University of Oulu, and Oulu Polytechnic (this is how the Oulu University of Applied Sciences was called by that time). Research professor Jouko Paaso was a Head of PBOL. In a beginning research fields included distributed software engineering methods, intelligent software solutions and technologies, as well as network and software business.

Groups of workers (including students) from every founding organisation shared working environment at PBOL and contributed to joined R&D operations. University of Oulu was in charge of fundamental and theoretical research. VTT was in charge of fundamental and practical research. Raahe Institute of Computer Engineering was in charge of applied research. Such excellent arrangement of PBOL’s operations allowed students from Raahe to be involved into a variety of R&D projects as members of any of the PBOL’s working groups. Students performed development and engineering work together with students of University of Oulu, and research staff of all three organisations.

One of the first international R&D activities at PBOL was the ITEA VHE-Middleware Project. The project was about interoperability between future Home Networks belonging to several distributed Smart Homes with a purpose of establishing of one Virtual Home Environment. It is also important to mention internationally-acknowledged works of Yrjö Hiltunen in such research area as the Artificial Intelligence (AI), particularly – on applying of Self-organising Maps (SOM) in a variety of applied cases.
In 2004, when Aarno Meskanen retired from his post as the director of the Raahe Institute of Technology and Business, Timo Pieskä was elected to this position. A new director also understood well an importance of an international collaboration. Staff exchange and mutual visits with foreign universities continued. During the past years collaborative agreements with several foreign universities, including some from Russia and Ukraine, were concluded. This brought a wide geography for a student exchange. A very effective collaboration was established with UBO, University of Western Brittany, Brest, France.

**Recent Practices**

Currently the Oulu University of Applied Sciences is reorganising own organisational structure and educational resources. The biggest changes are happening in Raahe. First, an early engineering full-time education of the Raahe Campus of School of Engineering (how it is called now) will gradually be transferred to Oulu, while a share of professional and adult education is planned to be increased in Raahe. Second, an increase of R&D activities is planned in Raahe. This will also include an international collaboration.

This year PBOL celebrated its 10-th anniversary. It is now called the Pehr Brahe Center for Industrial and Services ICT. Now PBOL operates under an agreement between Oulu University of Applied Sciences, University of Oulu, VTT and the Town of Raahe. A nature of collaboration between research groups changed in accordance to new agreement, but an idea of joined research remained.

A group from OUAS is the biggest at PBOL. It is completely formed by people from the Raahe Campus, but has a well-established cooperation with people from the Oulu Campus. The group is led by Markku Korhonen, who is at the same time a Head of R&D activities in OUAS Raahe.

Research areas are the following:

- Semantic Web and Technologies
- Artificial Intelligence, Software Agents
- System Interoperability, SOA
- Ubiquitous Computing
These research areas are very large and it is quite difficult to maintain a high level of expertise in all of them inside a group. This is where research collaboration may help. It is essential to acquire expertise and resources from own university, or from one of the partner organisations. In addition to that in Raahe strong cross-border collaboration with certain universities was established.

For example, exchange students may be employed to real development work during their project work courses. With UBO University from France, a practice of sending students for a practical training was acknowledged. Almost every year a group of three students from that university comes to Finland for a practical training at PBOL. As for expertise exchange with the same university, video-conferences and brainstormstms are organised few times a year. During those, joint research project opportunities, educational and organisational moments as well as concrete research problems are discussed.

Researchers from PBOL used to attend to high-level international conferences, workshops, and organisational events. It helps to maintain a level of knowledge and develop an international appearance. Reading research papers and watching presentations online will never replace a pleasure and a usefulness of a live conversation with an expert. By answering a proper formulated question, the expert may be able to save hours if not days of work. During such live conversations there may be an opportunity for clarification or refinement of information or even for a short brainstorm in a group of other people involved into a conversation.
Regular attending to international events of similar kind will allow knowing more people of that community and being known by them. Active participation to discussions and sharing knowledge and experience may help to maintain a positive image and cause an interest to own work of a participant. Thus there may occur an opportunity to discuss of research collaboration including joint applications for project funding (e.g. Seventh Framework Programme, Advanced Research & Technology for EMbedded Intelligence and Systems, Ambient Assisted Living Joint Programme, etc.).

One more way to maintain a level of knowledge and develop an international appearance is to be active in online activities relevant to a research domain. This includes a membership in selected associations, unions, forums, and boards; activities at public calls for reviewing documents (e.g. standards or specifications); evaluation of a work; or just attending to online discussions of important issues. It also includes activities in online professional networks (such as groups at LinkedIn).

One has to be aware though that online activities and a process of maintaining of collaborative connections by correspondence consume highly such an important resource as time.

A very important requirement for a successful international collaboration is an availability of a concrete result of a work in an area of an expertise. Generally saying, the best result of any work is if someone (e.g. a company) will use it. A good result should be demonstrated and described. A demonstration depends on a nature of the work: it can be a series of graphs, or a working prototype. A description of work is often a weak point in case of universities of applied sciences. The best description of work is a research paper or an article. But sometimes due to resource constraints it is even difficult to produce a proper documentation for the work. This may limit collaboration opportunities.

One of the practices adopted in Raahe is organising demonstrations and collaboration-discussion meetings with visitors and exchange staff from foreign universities. Sometimes visitors are also able to demonstrate results of their work. Research staff and teachers interested in those may be invited to attend to such
demonstrations. In case of mutual interest on certain work results, a further information exchange is following. This is where a lack of work description may have a negative impact.

When having a variety of research areas, it is easier to achieve success by refining a research for a smaller research domain. The OUAS group at PBOL was involved into research projects of different domains: mobile services, mobile marketing, enterprise information systems, industrial and business solutions, and home solutions. The last domain became to be a main scope of the most recent projects, such as UbiAtHome, SPIN, and Ryhti. During past projects, UbiAtHome and SPIN, practical solutions for a notion referred as Ubiquitous Home Environment (UHE) were developed.

UHE is a user-centric system – through which users can interact with their living environment and outside world – that is a part of global ubiquitous environment which is physically limited to a living area and surroundings. Home Environment is considered to be a main research domain of the OUAS group in an on-going project Ryhti. Knowledge and experience obtained in a given research domain by the group at PBOL, allowed OUAS to become to be a member of several international consortiums. One of those consortiums formed a project that was granted funding under the EU Ambient Assisted Living Joint Programme.

**Important Achievement**

From a spring of 2010 the OUAS group began international activities relevant to the Ambient Assisted Living. The group started from a poster presentation at AALIANCE conference in Malaga, Spain. One of a consequential activity was attending to the AAL Forum 2010 in Odence, Denmark. There was a chance to see presentations of big EU initiative as for a development of universal open platform and reference specification for Ambient Assisted Living (universAAL) – and to discuss with people from that project. Finland was not involved into the project.

As a result of discussions, OUAS was invited to collaborate with the universAAL consortium. From that time the OUAS group at PBOL started an evaluation of an opportunity for a similar R&D project in Finland. As a result a new initiative was
publicly announced 03.05.11 at the EU networking workshop organized by VTT. The initiative is called the Finnish Reference Platform for Home Environment.

Finnish Reference Platform for Home Environment – is a national-wide platform that could serve as a basis for home solutions and can be built by a joined consolidated effort of all the stakeholders. Thus an idea is to adopt the best from a variety of EU and Finnish R&D initiatives and commercial solutions and consolidate them into one approach. The approach will result in a reference architecture for home environment solutions and services that will bring considerable benefits to end-users, businesses, and academia. Such initiative will allow Finland to be at the edge of an international R&D in a domain of home solutions.

The initiative was presented to and discussed with the universAAL project consortium during the Open Day event in Pisa, Italy, 05.05.11. Collaboration schemes are agreed.

Updated description including technical and organisational details, a list of interested stakeholders and useful information about the Finnish Reference Platform for Home Environment will be available at the following URL:

http://finplatform.pbol.org