

## **HSN LAB – STRATEGIC INDUSTRIAL COOPERATION SERVING THE RESEARCH-ACADEMIC MISSION**

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### **Abstract**

In this article, the activity of the High Speed Networks Laboratory is presented. This lab is very important for the Budapest University of Technology and Economics, because it represents one of the strategic relations between the University and a company. The HSN lab is a rare and favourable example of keeping R&D inside the university, while the 'industry' receives what it wants: high quality labour force. The HSN Lab is also an important tool in keeping education up-to-date.

*Keywords:* university laboratory, research.

### **1. Introduction**

The HSN Lab (High Speed Networks Laboratory) started its activity in 1992 at the Budapest University of Technology and Economics (TUB); department of telecommunications and telematics. As a result of the dynamic development of telecommunication and informatics, colleagues from numerous other TUB departments joined the work of HSN Lab. HSN Lab's long-term strategic industrial partner is Ericsson Research, which is the research organization of the multinational company group. Our article will show how the HSN Lab can serve equally its research-academic mission and its Hungarian parent company with internationally related and recognised innovative researches and developments.

### **2. HSN Lab at Budapest University of Technology and Economics**

HSN Lab is based on voluntary participation of tutors, researchers, PhD students, students and employees – from different TUB departments.

HSN Lab's fundamental objective is to integrate the academic basic- and PhD education with research and development in the field of telecommunication and informatics in the following way:

- filling the individual forms in TUB's education (such as laboratory for specialisation, individual project laboratory, optional subjects, Students' Scientific Conference work, diploma work, PhD education) with content, which can be joined by students from other universities,
- cooperation with strategic industrial partners with significant research and development,
- reconciling its field with the long-term research and development plans of the strategic industrial partners,
- being appreciated as centre of excellence world-wide in its field,
- volume of basic- and PhD education carried out under HSN Lab must exceed significantly the level, which can cover the supply of strategic industrial – first and foremost national – partner staff.

HSN Lab provides exclusively tutorial and research work concordant with the academic mission on a higher level by the scientific and professional direction of voluntary joining and by the contribution of the industrial research area. Objectives mentioned above will be realised by HSN Lab in line with TUB's always-valid academic and faculty-level framework of rules on education.

Today, the cooperating departments in HSN Lab include the following:

- Department of Telecommunications (DT)
- Department of Microwave Telecommunications (DMT)
- Department of Measurement and Information Systems (DMIS)
- Department of Telecommunications and Telematics (DTT), host department
- Department of Computer Science and Information Theory (DCSIT)
- Department of Stochastics/Mathematical Institute (DSMI)

The center of cooperation is at DTT. DTT, of course, as the other cooperating departments, has numerous fruitful relations with other industrial partners as well, paying careful attention to that the activity should be suitable for general technical development and that the corporate knowledge is always handled confidentially.

Individual education and scientific work of PhD students and students are directed by academic and industrial consultants. The latter ones can be researchers and developers of strategic industrial partners. This activity can be realised within the HSN Lab in HSN research groups, which are distinguished by certain topic fields. A research group may consist of members of several departments.

The activity of HSN Lab includes all forms of R&D (interpreted in a broad sense) and it is embedded into the framework of an internationally significant science-flow. Nonetheless, HSN Lab always focused on the elite expert training in a considerable volume. This special intellectual university workshop participates in numerous basic- and applied researches on mathematical modelling, simulations, and measurements. The widespread innovation and R&D activities are made possible first by the leading international and indigenous companies, firms in the field of telecommunication and informatics giving more and more commission to the research groups of HSN Lab. Company relations mean strategic alliance for uncertain time, which makes confidential relationships more significant.

### 3. Development of the Ericsson Relation

The Ericsson cooperation, which was determining in HSN Lab's industrial relationship system, started in 1992. The main motivation of the foundation was a direct Swedish (Ellemtel – which had been mutual research institute of Ericsson and the Swedish dominant telecommunication operator, Telia till 1997) research institute commission. Ellemtel charged HSN Lab with a basic research in the field of 'mathematical and simulation methods in planning and managing telecommunication networks.' This cooperation was so successful, that Ellemtel soon started to support applied research and PhD education. An example of successful applied research and development is PLASMA – Planning Algorithms and Simulation for Network Management, which became an independent Ericsson software product.

There was and still there is a great significance of HSN Lab in Ericsson's existence in Hungary. The multinational company group built up its site in Hungary step by step. After the abolishment of the COCOM list, Siemens and Ericsson received concession for the reconstruction of the Hungarian Telecommunication Company in 1991, on the condition that they must also create a productive unit in Hungary. As next step, the Ericsson software house came into existence in Budapest. That time HSN Lab had indirect Swedish research institute relations (Ellemtel, Ericsson Research, Telia Research) and there were only minimal professional relationships with Ericsson Company in Budapest. The result of the indirect and fruitful Stockholm relation was that R&D units were established one by one on Ericsson's site in Budapest: Traffic Analysis and Network Performance Lab in 1996 and Conformance and Software Testing Lab in 1997. These research laboratories became parts of Ericsson Research. Then the Network Performance Product Unit was founded, which makes its product for the world market setting out from PLASMA software.

HSN Lab nowadays cooperates with the Ericsson Research laboratories of both Stockholm and Budapest.

### 4. Operation of HSN Lab

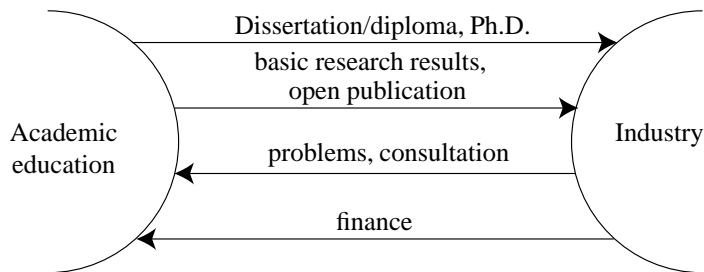
The operation of HSN Lab is not measured on a project basis. The existence of the lab in Budapest is considerably determined by the fact that HSN Lab should train PhD students in such a high volume, on such a high level, and with such a professional direction that the further development of Ericsson research laboratories remains in Budapest. It must be taken into consideration in the volume of education that some senior students of HSN Lab necessarily start working at the rival companies.

There is an individual elite education for students and PhD students in the focus of the activity of HSN Lab, but the main measuring number of the activity of HSN Lab is connected only to the number of PhD students, to make things easier. It means that the basis of accounts is the so called equivalent PhD number, which expresses that to what extent a PhD student spends his/her time dealing with a topic

reconciled with a strategic partner in the framework of his/her scientific education.

Nevertheless, members of HSN Lab and partner industrial researchers are in an almost everyday contact with each other via computer- and telecommunication network and on regular personal meetings, too. An essential element of the cooperation is that the industrial partner must support the activity of HSN Lab not only financially, but with consultations as well. Moreover, at the end of each semester PhD students and the most excellent students of HSN Lab can participate on an exclusive international HSN Scientific Conference showing their scientific results and they can also learn their strategic industrial partners' range of interest. International interest about HSN Scientific Conference is continuously growing. Public scientific statements of HSN Lab appear in international, reviewed publication forums. Currently, approximately 60 publications come out per year. There are more and more foreign professors in the PhD examination committees for the PhD students from HSN Lab.

To sum up, we can say that the HSN Lab realises basic research and individual education in a significant volume with industrial support. Research and development oriented academic education in a significant volume needs a long-term strategic industrial relationship. On the other hand, research and development is a sensitive area of industrial companies. This kind of cooperation is based on a gradually built up, two-directional system of confidentiality. A simple interpretation on the operation of HSN Lab is shown below.



*Fig. 1.* Model of strategic university-industry relations

HSN Lab uses all of its total industrial support through the financial system prescribed by TUB. HSN Lab has a significant role in that DTT attained leading positions in many academic years according to the complex economical and scientific indexes. Some of the PhD supervisor statuses are covered from the revenues regularly and reliably paid by the strategic and other industrial partners.

## 5. Industrial Relations for Academic Mission

Today, more and more segments of valuable academic mission are delivered for the society:

- research university: developing knowledge
- tutor university: high-level handing over of knowledge
- service university: application of knowledge
- entertainment university: spreading knowledge, as a general value.

These missions can appear simultaneously, and they can even strengthen each other.

Primary services:

- basic education (graduate engineer)
- graduate researcher education (PhD)
- further education on the basis of widespread advertising

The primary services are public. Opportunity to establish academic–industrial relations on the basis of mutual benefits are present even in the primary services, especially through laboratory exercises initiated by the industry in higher classes, Students’ Scientific Conference work and diploma work by collective academic–industrial consultation added. This way the seeds of research can also appear.

Secondary services:

- education for companies
- advising/practical experience
- R&D contracts with a given task, deadline and contracted amount
- acceptance of general or targeted donations for supporting primary/secondary education and basic/applied research
- creating innovation parks
- strategic relationship
- university laboratory supported by an industrial partner in the form of long-term framework
- creating a collective centre.

Secondary services may raise questions of proprietary rights of intellectual products, which need careful university–company reconciliation. The related knowledge may become public only after legal protection and/or scientific publication.

HSN Lab can connect the primary and secondary services together with its industrial partner, so that secondary services have positive effect on the primary services.

## **6. Main Features of R&D in Multinational Companies**

Production of greatly sophisticated products/services takes place economically in multinational companies. International line-up can be necessary for the capital withdrawal, the intellectual resource basis, the level of economical volume, optimisation of covering the costs of mass production, optimisation of providing quality, not to talk about the selling network. R&D and certain production phases can also

take place in the most developed countries, and demand of all the countries in the world is satisfied from them.

However, the number of resident technical professionals is not satisfactory in developed countries. Moreover, they have to serve every country; originally the enterprise may as well had begun in a developed country with smaller population and young people consider works pertaining to law or business more attractive. There are two opportunities to solve this problem: to lure talented people from less developed countries, or to settle R&D activities in developing countries with high technological culture. Multinational companies apply the combination of the above two solutions in different proportions.

Multinational companies are in fierce competition with each other on the world market and R&D has a significant role in it. Thus there can be a competition in some countries for intellectual resources as there are so many places in the world, where R&D activities can be done. R&D activities can be then settled in developing countries according to a kind of scale: to what extent the local technical academic education makes R&D competitive from the point of view of content and confidence. Further, there are some locations where the multinational R&D sites have demand for a large amount of cognitive competence in some of the fields.

Lars Ramquist, former president of world company Ericsson defined it briefly, as follows: 'Ericsson is a multinational company and goes where the competence is'.

## **7. Summary**

The strategic university–industry relation, which was shown via the example of HSN Lab, supports the simultaneous realisation of the University's missions and innovative developments for the parent company in Hungary. The only constraint of attracting and developing national R&D units is the extent to which higher education can provide qualified researchers and developers. The level significantly depends on the maintenance of internationally developed cooperation and competition. At TUB there has always been an over-application of secondary school students for graduating in 'technical informatics' and 'electrical engineering' as compared with other higher education institutions with similar profiles. The quantity of graduate students depends on the supports for higher education – including budgetary sources that influence the students' number, tutor statuses, basic areas – which can determine the opportunities of national innovation in the long run.