

Industry – University Collaborative Networks for New Product Development: The Case of the TeNeT Group in IIT Madras, India

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Abstract

Most of the times, research on collaborative environments focuses mainly on the creation of networks made up mainly by companies, and less attention is paid to the different actors in the territory and the local infrastructure provided to these enterprises (specially SME's), which in many cases enable or disable them to be more innovative. Different authors have recognized the increasing pro-active role of the territory in the learning processes of the economic agents and productive organizations.

Universities play an important role, as they can be considered as a focal element for the development and dissemination of new knowledge and technologies for the design, development and commercialisation of new products and processes. Therefore, research should also be done to analyze and promote different agents in the territory, such as Universities as potential partners to be integrated in these new collaborative environments for the transfer of knowledge to foster innovation and promote regional sustainable development. Therefore, the ability of Industries and Universities to collaborate to develop innovations can enable companies' sustainability increasing the overall region competitiveness. This paper will present the results of a research carried out in the Indian Institute of Technology (IIT) in Madras which intended to assess IIT's key role for developing new products and generating new high tech companies. The paper will present case study of the Midas company which was the first spin off of the TeNeT group.

Keywords

University – Industry Networks, New Product Development, Regional Sustainable Development, Innovation

1 Introduction

Knowledge has always been at the heart of economic development, the success of firms and national economies are more dependent than ever on the capacity to produce and use new knowledge. Innovation and technological change have become more central to economic performance [OECD, 2002]. New knowledge is therefore required to achieve innovation: for the development of new products and the improvement and introduction of new processes. As a result, countries have realised that knowledge has been seen as one key element for development. The Organization for Economic Cooperation and Development [OECD, 1996] introduced the term "knowledge-based economy," defining it as an economy directly based on the production, distribution and use of knowledge and information. Based on this, many countries have started to design and implement policies that can lead them to compete in this new business arena based on the creation and transfer of knowledge.

The National Innovation Systems report [OECD, 1997], points out that technical progress is largely the result of a complex set of relationships among institutions and individuals, who produce, distribute and apply various kinds of knowledge, and thus translate the inputs into outputs with higher degrees of value-added. The links that tie them can take the form of joint research, personnel exchanges, cross patenting, co-publication, purchase of equipment and a

variety of other channels. The performance of a country in innovation depends on the effectiveness of these ties in uniting the diffuse elements of a collective system of knowledge creation and use.

In the last years a growing interest has emerged to understand the role and significance of Universities and research institutions in the Knowledge Based Economy to achieve innovations. Not surprisingly, the effect of this new “Entrepreneurial” role of Universities have been subject of an international debate over the appropriate role of the University in technology transfer and new knowledge creation and commercialisation [Freeman 1987], [Mowery 2002], [Etzkowitz, Webster., Gebhardt, Cantisano 2000], [Lundvall 2002], [Arocena, and Sut, 2001], [Rosenberg and Nelson R 1994] and [Casas 2003]. For instance, Etzkowitz and Leydesdorff [2000] proposed the Triple Helix Model where Universities have a “third mission”, which consists of direct contributions to the industry. Others, instead argue that Universities should maintain their teaching and basic research task. Nevertheless, few studies have tried to understand how these University-Industry relationships start, evolve, weather they achieve successful results or not and the positive or negative externalities that they could provoke.

Several efforts are being carried out around the world to understand this new role of Universities in developing new products and services together with the industry such as:

- The survey of “University-Industry Collaboration activities” developed by the Research Institute of Technology Trade and Industry (RIETI) in 2003 in Japan [Motohashi, 2005]
- The report “Science and Technology Resources of Japan: A comparison with the United States in Japan” in 1997 in Japan
- The Study “Mapping the Nature and Extent of Business - University Interaction in Australia” developed by the Australian Research Council in 2001
- The Government, University, Industry Roundtable Report, 2003 in USA
- The Local Innovation Systems Project developed at the Industrial Competitiveness Centre of the Massachusetts Institute of Technology (MIT), 2006 USA
- The Lambert Review of Business-University Collaboration, 2003 in the United Kingdom

As observed, most of these studies are being realised in developed economies, meaning that there is still work to be done to understand and analyse how Industry-University collaboration takes place in developing economies to enable innovation. Therefore, the purpose of this paper is to present the findings of a research carried out in the Indian Institute of Technology (IIT Madras, India) about the TeNeT group which started in 1994 encouraged by the dream of three professors to develop the rural areas of India: Dr. Ashok Jhunjhunwala, Ramamurthi and Gonsalves. At that time, they realised that there were 8 million telephone lines in India, which covered only 1% of the population. The costs of telephony were very high for the Indian society as mainly all the technologies were imported. As the telephone lines consisted of mainly copper and fibre each line costed about 50,000 to 60,000 INR, therefore this solution was very expensive and decided to analyse the possibility of wireless technology. As a result, the corDECT solution was developed, the first breakthrough from the TeNeT group and had a 15-35 radius wireless reach and was targeted for the rural areas. The initial cost per line was 18,000 INR and currently is 10,000 INR. To develop the idea, four years were required and was the first Indian solution that could compete with other well known brands such as Nokia, Ericsson, Motorola, Siemens and Qualcom. The idea and development was further managed by a new company called MIDAS, which has a very successful economic performance and its currently growing in local and international markets.

2 Research Objectives and Approach

The research approach selected was to develop three *case studies* of different spin-off companies from the TeNeT group to understand how new knowledge was created and shared between the IIT staff and the group of entrepreneurs, lead by Dr. Ashok Jhunjunwala. For the analysis, three case studies were performed as shown in figure 1. The objectives of the research were to:

- • Study how innovation process takes place between IIT Madras professors and the TeNeT companies.
- • Analyze how these collaborations enable innovation, transforming research into commercially valuable products.
- • Identify how these collaborations could enable or not the formation of new high tech industrial clusters in a developing country context.

A case study is an examination of a specific phenomenon such as a program, an event, a person, a process, an institution or social group. The bounded system, or case, might be selected because it is an instance of some concern, issue or hypothesis. According to Yin (1994) a case study is an empirical inquiry that:

- Investigates a contemporary phenomenon within its real life context, specially when
- The boundaries between the phenomenon and context are not clearly defined

The defined *research questions* to perform the case studies were:

1. 1) How do IIT Madras professors and the TeNeT companies collaborate?
2. 2) How do new products are developed and launched into the market as a result of these collaborations?

A key strength of the case study method involves using multiple sources and techniques in the data gathering process. For the three case studies, face to face interviews were carried out with IIT Madras professors and entrepreneurs that are part of the TeNeT group. The *unit of analysis* was “The TeNeT group collaboration process” from the firm perspective; therefore, a *questionnaire with open and closed questions* was developed to interview the three companies. It was divided in four main sections: 1) Company General Information, 2) Industry University Collaboration, 3) Improving and Enhancing the Industry University Collaboration and 4) Industry – University Knowledge Interactions and Technology Transfer. In total 70 questions provided the detail to answer the pre-defined research questions. For the current paper the Midas case will be described as it was the first spin-off of the CeNeT network.

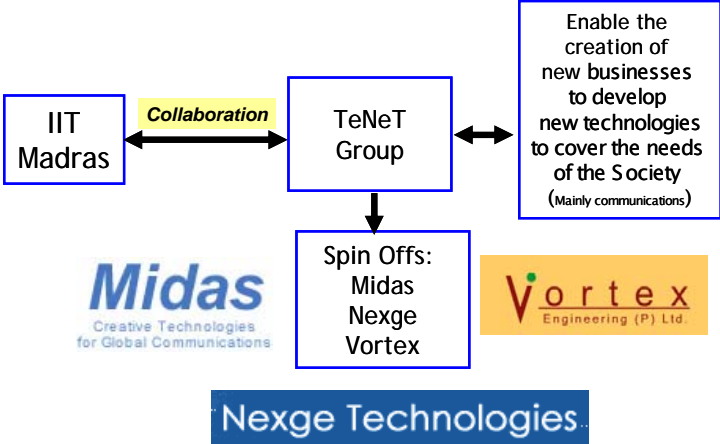


Figure 1 Case Studies realised of Spin Offs from the TeNeT group of IIT Madras

3 The TeNeT Group at the Indian Institute of Technology (IIT) Madras

The Indian Institute of Technology, Madras (IIT Madras) is a college of engineering located in Chennai, India. Founded in 1959, it is chronologically the third among the Indian Institutes of Technology established by the Government of India to provide high quality education in the fields of engineering and technology. It all began in 1956, when Pandit Jawaharlal Nehru, Prime Minister of India, was on an official visit to West Germany and was offered assistance by the Government of the Federal Republic of Germany, to set up a higher technological institute in India. This resulted in the signing of the first Indo-German Agreement in Bonn in 1958, for the establishment of an Indian Institute of Technology at Madras. The Institute has several departments and advanced research centres in various disciplines of engineering and the pure sciences, with nearly 100 laboratories organised on a unique pattern of functioning. A faculty of international repute, a brilliant student community, excellent technical and supporting staff and an effective administration have all contributed to the pre-eminent status of IIT Madras.

The Telecommunications and Computer Networks Group (TeNeT) is a dedicated aR&D team, working in the field of telecommunications and computer networking in the Indian Institute of Technology Madras. TeNeT is headed by a group of faculty in the Electrical Engineering and Computer Science Departments and has over a hundred engineers, researchers and technical staff. The mission can be summarized as developing new technologies, fostering research and establishing a man power base in the field of telecommunications and computer networking.

The TeNeT group started with a clear vision: To develop new technologies that can be affordable to the rural areas in India to allow them to communicate and develop, by enabling them to have wireless connectivity, providing the rural areas to access Internet, have on-line courses both for children and adults, providing health care solutions to make diagnostics with the aid of internet connections to doctors even if they are far away, providing financial ATM services, etc.

The main goal is to design and deliver state of the art products that can compete in International Markets, which are at the same time specifically suited to developing countries, such as India, in terms of affordability and adaptability.

TeNeT performs at least one monthly meeting with the different companies and professors linked to the network to develop new ideas to develop new products. If one idea looks feasible, TeNeT will try to find the adequate partner through the alumni network. One key issue about TeNeT is that it has created its own venture capital structure to enable the financing of the new ideas into products. For the TeNeT growth, IIT Madras has provided the infrastructure. After an idea is created (internally or externally), the TeNeT group will evaluate if the competencies are existent within the TeNeT or in IIT (to create synergies is very important). The new technology to be developed should be cost effective and competitive in the global market, focusing on developing countries needs. The new technology will be of great interest if it can also provide new competences to the TeNeT group as a whole. After the pre-screening phase is finished the TeNeT group will decide to go forward with the complete development or not. The main processes of TeNeT to develop new products and companies to deliver them to the market is shown in Figure 2.

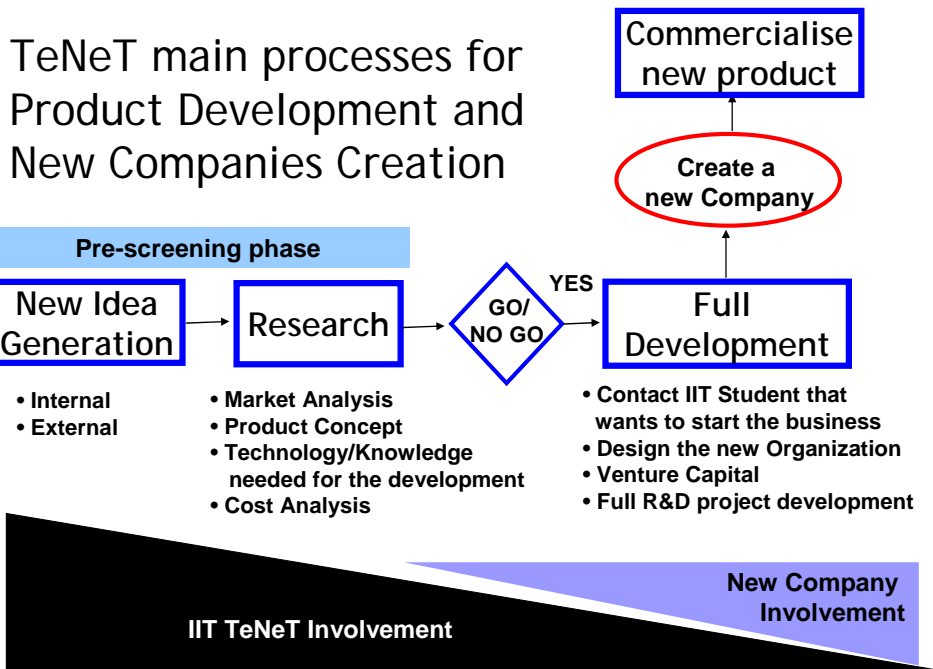


Figure 2: Main processes for the development of new products and companies

The creation of the different new companies in the TeNeT Group seems to be connected, as ideas are continuously generated as needs in the rural areas in India need new technological solutions, as shown on Figure 3. The TeNeT group inside IIT Madras can be considered a small cluster of 14 Telecommunications and Software development companies that looks forward for developing and commercialising new technologies that can allow the sustainable development of rural areas in India in terms of communications accessibility and affordability. This could be very difficult without the technical support and infrastructure provided by IIT Madras.

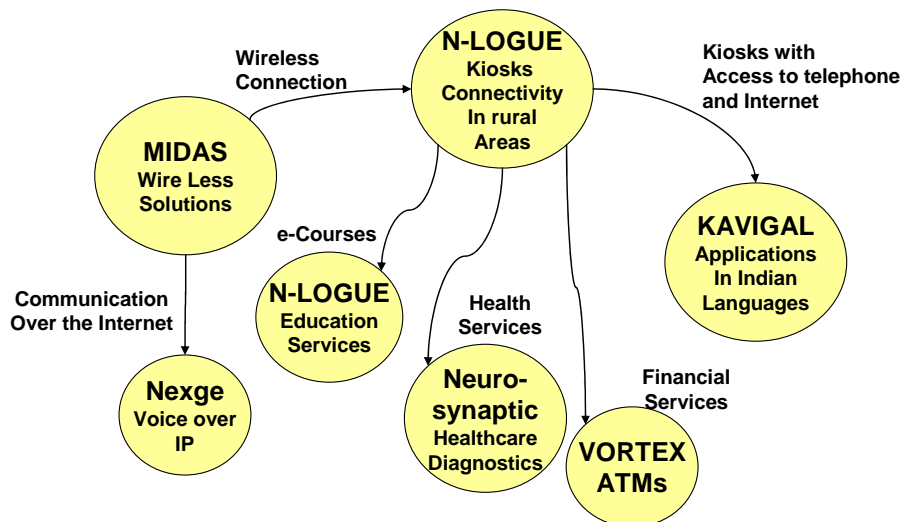


Figure 3: The evolution of new solutions and companies within the TeNeT group

4 The Midas Case Study

Midas is a technology company built on a partnership of the top minds in wireless technology and business leaders. Over the years, it has successfully developed and implemented viable technologies for the developing economies, with solutions ranging from toll quality voice and dedicated internet access to meet the needs for rural communities. Midas current activities in

access technologies include the corDECT and the optiMA products. The CorDECT is a fixed wireless platform and probably the only one providing simultaneous toll quality voice and internet at 35/70 kbps. corDECT enables incumbent service providers quickly multiply their existing infrastructure while being cost effective even at low subscriber densities for greenfield operators. OptiMA is a fiber in local loop solution that offers ISDN and broadband services like xDSL and Ethernet suitable for urban scenarios. Midas has a unique solution that offers simultaneous voice and internet on a single line. Unlike networks based on mobile cellular platforms, where the bandwidth in a cell or sector is shared amongst active users, the corDECT system provides dedicated bandwidth to every user. The company has reached across 4 continents with approximately one million lines .

Innovation is the key to Midas success. Midas was the first company launched by the TeNeT group. The development of the first product together with the company took approximately 4 to 5 years. For the product development, several competences are required such as: Design High speed digital circuits, line interfaces and power supply, RF circuits, DSP and firmware, switching software and country adaptations, network management and solutions planning tools. The company currently invests about 20% of its turnover in R&D. MIDAS is the first spin off of a the Indian Institute of Technology TeNeT group and has been very successful. Its current turnover is approximately 60 million US and is a main premier provider in countries in Asia, Latin America and Africa. The owner was approximately 30 years old when we decided to start the business. As an ex-IIT student he was always in contact with the IIT staff and since he heard of the project idea, he was really interested. Mr. Shirish the company CEO stated that “the TeNeT group has always believed in a more developed society by the usage of IT solutions and that that society should be able to develop its own technologies”. For the development of this dream a strong leadership and vision is required. He also mentioned that the development of the technologies could have not been possible without the support of IIT Madras staff. He believes that the ideas should flow in a bidirectional way, from the company to the University and from the University to the company and new ideas should always look for market potential.

Midas established a loyalty licensing agreement with IIT Madras before the project started. Currently the company is looking forward to innovate in terms of products and processes and has always considered IIT as a partner for innovation. In terms of financial value, the TeNeT IIT link has definitely contributed to this. Another interesting fact is that the company has also transferred knowledge and technological trends to the IIT professors, which can serve as a good basis to teach real case studies to students. Midas participates to the monthly meeting that takes part in IIT with all the TeNeT group, to share ideas and identify new business opportunities. The company is very open to collaboration and has always had positive results when collaborating with the TeNeT IIT group and professors. Many publications have been done since the company started operations. Mr. Shirish thinks is important to let the world know what Indian Universities and companies can accomplish. MIDAS also encourages employees that are interested to obtain Masters and PhD degrees in IIT Madras while working in the company and at the same time the firm is open to recruit scientists coming from Universities that can bring ideas an new knowledge to maintain and increase the current technological competences of the company.

To conclude is important to mention that Mr. Shirish, CEO of Midas, also believes that “for a country like India, Universities have had as main objective to teach, but in order to develop new advanced technologies to enable the development of societies, advanced knowledge and skills are required and in many cases are not present in entrepreneurs who just want to start a new business, therefore the Universities should play a more active role in these developments. Governments should formally change the agenda for Universities which should include teaching and technology development. New companies should start operations in developing countries to

offer solutions, like telecommunications, for the society to enable their development. Without local companies offering affordable products, the development will take too long. A new integrated and collaborative vision and commitment is required from Government, Industry and University to increase technology development in emerging economies”.

5 Main Findings

There is no doubt that the TeNeT group is an example for the development of new solutions for the rural areas in a catching up country and the creation of new companies in order to commercialize them. The dream and commitment of three IIT Madras professors to develop the rural areas in India, together with the competencies and infrastructure provided by IIT Madras have enabled the formation of 14 new companies which can be considered a very innovative cluster in the communications and software development sectors. This could have been very difficult without the technical support and infrastructure provided by IIT. Companies such as MIDAS, NEXGE and VORTEX with the support of the TeNeT group have worked for the dream to develop the rural areas of developing countries providing new affordable solutions. Key findings for this success are:

- **Collaboration:** Besides hiring IIT students and obtaining information from IIT Madras staff, which are the typical Industry-University types of collaboration, the three case studies show very high collaboration for joint projects and acquisition of loyalties for new product development and commercialisation.
- **Product Innovation:** The targeted products are either new to the global markets or new to India
- **Competences:** skills both from professors and entrepreneurs are available. The transfer of knowledge is not only from the IIT Madras to the companies, but bilateral. New knowledge is created and shared in and by all the TeNeT group. CeNeT entrepreneurs have working experience in other companies; which facilitates the commercialisation of the new products to the market as professors usually don't have industrial working experience. Companies take advantage of IIT Madras laboratories and overall infrastructure.
- **Informal contacts:** Professors from the CeNeT group started the spin-offs by contacting their ex-students and integrating them to the network. These contacts facilitated the network to take-off and to develop the new products.
- **New product development process:** The CeNeT group has defined a clear methodology to develop new products, where all the members contribute for the generation of ideas, for their assessment and selection. Professors from CeNeT also look for venture capital in the USA.
- **Market:** The market focus is clear and shared by all the members: to develop ICT technologies in for the rural areas in India. Members of the TeNeT group are also highly motivated to be competitive in international markets and their technologies are being sold in several countries with similar business opportunities in Asia, Africa and Latin America.
- **Trust:** There is a high level of trust between IIT Madras professors and entrepreneurs from the TeNeT group. The strong leadership from IIT professors to hold the group together and target one specific need to develop India has made the group to work towards a common vision and goal.

6 Conclusions

The current article presented how industry-university collaborations are being carried out at the Indian Institute of Technology Madras in the CeNeT group to deliver new high-tech affordable products to developing markets. During the interviews, it was also identified that a new measurement system for both the University and Companies could be implemented to motivate and increase their collaboration. Usually companies don't see Universities as business partners, and in most occasions there is not even a strategy from the top management to motivate the interaction. On the other hand, researchers in academic institutions are more interested to publish academic papers. Successful collaboration with firms is usually not measured by Universities in terms of "new products or innovations launched into the market as co-developments". Professors research performance is measured in terms of published papers and not on successful implementation of projects with the industry. Therefore, a new measurement system could be implemented both in the companies and in the Universities to track and motivate the collaboration between them and enable the development of new technologies such as in the TeNeT group of IIT-Madras.

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