MARKET ENTRY OF INNOVATIVE PRODUCTS USING KNOWLEDGE ACQUIRED BY MATERIALS SCIENCE AND ENGINEERING

Jaroslav Jerz[1], Barbara Wilfinger[2], Rainer Hasenauer[3], Peter Filo[4], Mária Lazarová[1], Tanya Toroud[5]

[1]Institute of Materials & Machine Mechanics, Slovak Academy of Sciences, Bratislava (SLOVAKIA)
[2]Institute for Economic Promotion, Austrian Federal Economic Chamber, Vienna (AUSTRIA)
[3]Marketing Management Institute, Vienna University of Economics and Business (AUSTRIA)
[4]Business Faculty, University of Economics in Bratislava (SLOVAKIA)
[5]Cross Border High Tech Center Project N00092, University of Technology, Vienna (AUSTRIA)
ummsjerz@savba.sk, barbara.wilfinger@wko.at, rh@hitec.at, filo@euba.sk, ummsmlaz@savba.sk, toroud@iap.tuwien.ac.at

Abstract

The knowledge transfer platform INNOVMAT supports innovation activities of enterprises from Central European region by transfer of knowledge acquired by R&D in the field of advanced engineering materials and related technologies of their production, joining and processing into industrial practice. The main mission of INNOVMAT is to support the development of industrial products with extremely high added value and to increase competitiveness of companies with high potential for application of newly developed engineering materials and advanced technologies. INNOVMAT consolidates in the region of Vienna – Bratislava material research as a forerunner of a sustainable economic and social development and supports the knowledge generation stages in this scientific field and its transfer into various industrial sectors.

Economically successful high-tech innovation is one of the driving forces for global welfare. The requirements in high-tech innovation marketing are an on-going dialogue between technology, finance and marketing. This paper aims to show the requirements of multidisciplinary communication in B2B marketing of high-tech innovation and methodical approaches in research and academic education.

Keywords: High-tech innovation marketing, multidisciplinary education, engineering materials, advanced technologies, knowledge transfer, business intelligence, regional development.

1 INTRODUCTION

The platforms INNOVMAT (www.innovmat.eu) and CHC - CROSS BORDER HIGH TECH CENTER (www.hitechcentrum.eu) cooperate in supporting of industrial enterprises by accessing of high-tech innovations related to using of newly developed engineering materials and advanced technologies for their business activities. The main aim is to support the development of sustainable industrial products with extremely high added value and to increase competitiveness of companies with high potential for application of advanced engineering materials and related technologies of their production, joining and further processing.

The users of knowledge in the field of engineering materials expect to benefit significantly by finding appropriate solutions to their needs. As a result, they often develop new innovative products or services themselves because they can't or don't want to wait for them to become available commercially. The needs of new sustainably developed products and services are general in a marketplace, but the industrial companies with a large innovative potential face them months or years before the bulk of the market encounters them.

The requirements in high-tech innovation marketing is an on-going dialogue between technology, finance and marketing and therefore an experimental method of marketing test beds for innovative

high-tech start-ups based on a multidisciplinary approach is of prime interest in the nowadays world full of high-tech engineering solutions.

2 KNOWLEDGE TRANSFER MANAGEMENT

In order to promote the generation of knowledge in the field of engineering materials and to support its subsequent transfer into the industry and other socioeconomic bodies, the concept of platform INNOVMAT was conceived within the project co-financed by the European Regional Development Fund under the program of Slovak-Austrian cross-border cooperation 2007-2013. Upon the creation of knowledge transfer platform INNOVMAT various objectives were defined:

(1) to identify scientific results generated by the associated research groups and assessing their knowledge transfer capacity;
(2) to ensure adequate dissemination of knowledge acquired by R&D activities of the most appropriate research groups mainly in collaboration with other industrial, scientific and financial intermediating organizations by organizing of thematic workshops on actual topics of materials science in order to offer an overview of current trends (INNOVMAT / academy);
(3) to mediate of contacts through the cross-border cooperation B2B and R&D2B meetings of scientists from R&D institutions and developers mainly from industrial SMEs during innovation days organized regularly on both sides of the Austrian – Slovak border;
(4) to facilitate the transfer of disseminated knowledge to industry or, where appropriate, the correct assimilation of novel advanced technologies;
(5) to support the funding and legal issues (intellectual property, preparation of license agreements, etc.) during cooperation in R&D through consultations, development and dissemination of manuals, mapping reports, etc.;
(6) to manage the R&D and licensing contracts with the aid of administrative services of universities or scientific institutions;
(7) to create a database of knowledge, infrastructure and R&D capacities of corresponding universities and scientific institutions;
(8) to create a virtual network of professionals which provides direct access to experts, equipment and services in the field of engineering materials, technologies of their production and processing, related legal issues, grants, etc.;
(9) to provide information regarding European R&D programs and offer technical support in the drafting and management of this types of projects, etc.

2.1 INNOVMAT / academy

The R&D institutions and universities working in the field of materials science can be a significant factor during an economic recovery if they support businesses based on advanced technologies developed by R&D activities of their scientists. The mutually beneficial cooperation relationships between research laboratories and private sector funding are unavoidable for recovery efforts. The commercialization of knowledge acquired by basic and applied research in the field of engineering materials and development of advanced technologies for their production and processing fosters the creation of new businesses in the case that various stimulus funding and venture capital are continually in the equilibrium.

In this context, it is extremely important to keep in touch with scientists who push the boundaries of human technical knowledge in this scientific field. The INNOVMAT / academy therefore organizes expert workshops on recent developments in the field of new engineering materials and advanced technologies for their production and processing for cooperation partners of INNOVMAT platform. Workshop topics are precisely selected in order to reflect at its best the priority directions of R&D institutions located in the central European region with sufficient application potential in regional industry.

2.2 INNOVMAT / contactor

INNOVMAT enables efficient system for linking scientists and experts from the academic community and the industrial enterprises working in the field of materials science and related technological development. This system provides very effectively the transfer of knowledge and more rational purchase of equipment, realization of complex R&D projects, etc. The aim of these networking activities is to get in touch the experts with key target groups and persons and to inform them about

activities of INNOVMAT platform. The both LinkedIn and Xing professional networks are successfully utilized for this purpose. LinkedIn (http://www.linkedin.com) is the largest social business network in Europe mostly used by English speaking people. This is why it suits very well both Austrian and Slovak partners of INNOVMAT platform to get in touch with key targets in their professional areas. Xing (http://www.xing.com) is the largest German speaking social business network. This is why it suits best for targeting Austrian key persons and groups interested in cooperation with experts of INNOVMAT platform. Both LinkedIn as well as Xing professional networks provide the ability to use own established “INNOVMAT groups”, where interested persons are involved in providing and sharing information and serving them in business areas of INNOVMAT platform.

The beneficiaries of INNOVMAT platform's activities are industrial companies, especially manufacturing SMEs with a good potential for both the product and the process innovations, which are able to apply advanced engineering materials for enhancement of added value of products and by this way to make benefits by effective commercialization of knowledge acquired by R&D in the field of materials science & engineering.

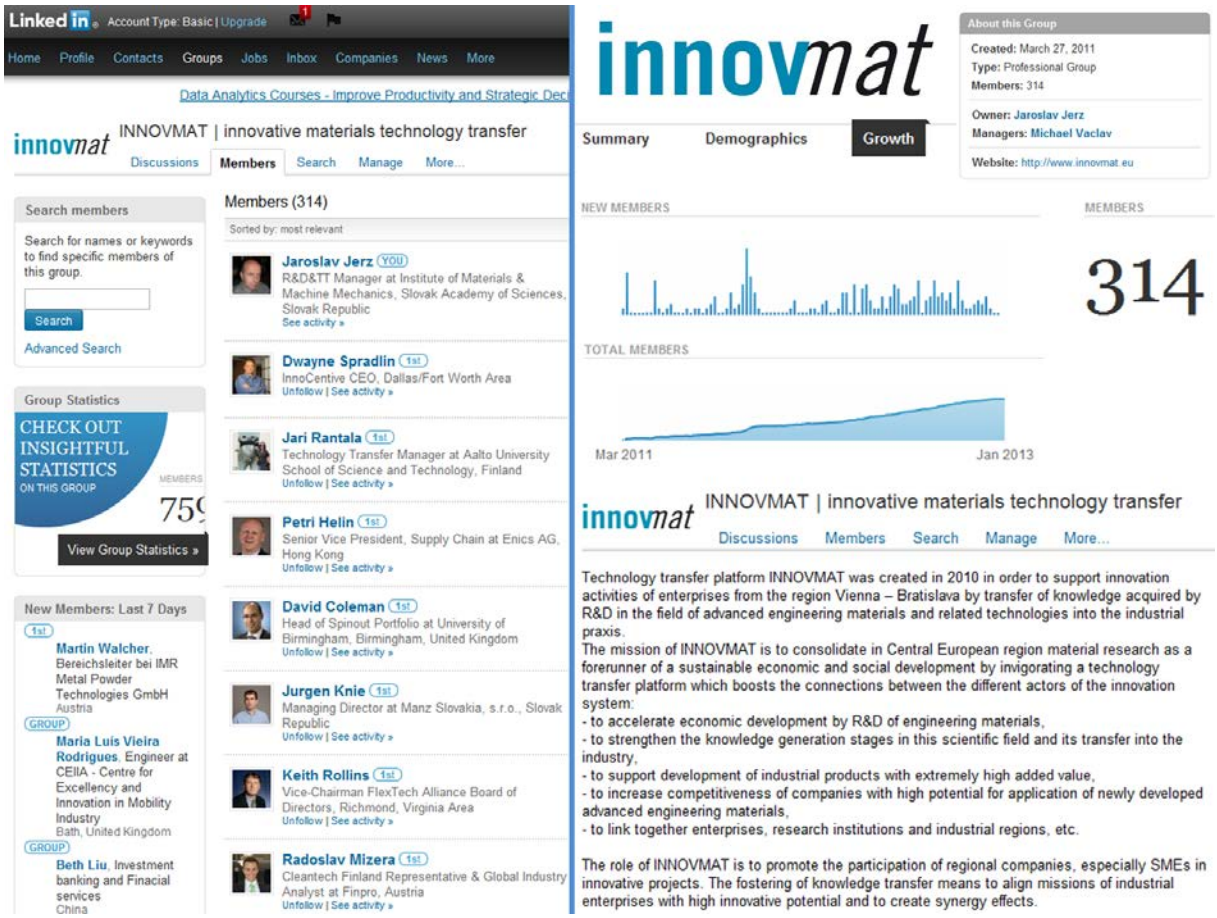

Fig. 1. Web page of INNOVMAT group created via LinkedIn professional network. The group networks experts in the field of materials science and engineering with key target groups from industry in order to support effective commercialization of knowledge acquired by R&D.

In order to support cooperation of scientists from R&D institutions and universities with industrial enterprises in identifying of appropriate industrial applications for advanced engineering materials INNOVMAT platform established and maintains module INNOVMAT / contactor, for organizing of innovation days, B2B and R&D2B meetings, as well as for networking of INNOVMAT cooperating partners via professional social networks. The main objective of INNOVMAT / contactor is to offer new opportunities and competitive advantages through co-operations in R&D. The innovation days organized by INNOVMAT platform are focused on boost of business using of newly developed engineering materials and advanced technologies. These events facilitate industrial enterprises access to scientists working in the field of engineering materials.

2.3 INNOVMAT / expertise

Platform INNOVMAT promotes knowledge transfer in the field of engineering materials across Central European region. It consists of the public internet database of experts, scientific equipment and services related to the materials science and R&D activities carrying out by scientific institutes and universities preferably from region of Vienna – Bratislava. Experts listed in the database are contact persons for users interested in a material, process or service offering by a contact person's institution. The goal of INNOVMAT / expertise database is to create a network of representative experts for the whole scope of INNOVMAT objectives. This database is of full public access – anybody can search in it on the INNOVMAT platform website without need of registration.

3 INNOVATION MARKETING: MARKET ENTRY FOR INNOVATIVE FUNCTIONAL ENGINEERING MATERIALS IN B2B MARKETING

3.1 High Tech products / market entry

It is expected as the main result of the CROSS BORDER HIGH TECH CENTER (CHC) research project N00092, activities and experiences in multidisciplinary education deliver more marketing-technology oriented insights to facilitate critical phase of market entry for innovative products.

The high technology sectors are characterized by the unusually high uncertainty in the domains of markets and technologies [7, MORIARTY]. This statement is widely recognized as the beginning of the systematic research in the field of high-tech marketing discipline [8, TARAS]. Leaders of organizations that better perform under such circumstances demonstrate skills to dynamically sense changes in the business environment and respond to them with focused, fast and flexible actions [9, HORNEY]. Organizations should encourage different and heterogeneous combinations of information processes to succeed in turbulent environments which characterize marketing of high technology goods and services [10, STEWART].

3.2 High Tech marketing capabilities / failures

Important determinants of relatively higher financial performance within high technology sectors include marketing, R&D and operations capabilities along with interactions among them [11, DUTTA].

Marketing capabilities mean the combination of physical, human and organizational resources that predetermine the abilities of the firm to develop and execute a set of activities in order to achieve the desired objective [12, BANTERLE]. Marketing capabilities are identified as the integrative processes designed to apply the collective knowledge, skills, and resources of the firm to the market-related needs of the business, enabling the business to add value to its goods and services and meet competitive demands [13, AFZAL].

Many innovative products fail to meet their expected market share. While preliminary market surveys may report a large portion of potential buyers, the actual sales might reach only a negligible fraction of the market [14, McMATH]. Thus conditions of high-tech marketing suggest that companies should strive to develop their marketing capabilities in the agile way.

Increasing attention has been paid to the question of how firms acquire and improve their capabilities in the literature [15, FAHY]. There are different approaches to answer this question [8, TARAS].

3.3 CROSS BORDER HIGH TECH CENTER (CHC) approaches in High Tech marketing capabilities

The eventual market share of a product depends crucially on the nature of interactions between marketing capability of demand side and supply side and their network of connections.

Each agent (buyer / seller) is characterized by a value / benefit. Market driving is represented by a firm's ability to lead fundamental change in the evolution of industry conditions by influencing the value creation process at the product, market or industry levels [16, MOHR]. In high tech marketing; values are specific solutions to detail problems or preferences which define the relationship between customer desires and the seller / product capabilities.

The development of marketing capabilities requires an interdepartmental integration as a combination of interaction and collaboration [17, GUENZI]. Thus, the language gap is not the exclusive case between buyer and seller; also it is the critical case between finance, engineering and marketing departments of innovative firm. The mentioned departments are interlinked and influential in valuable high tech marketing capabilities and the important phase of it, which is market entry. As a result the concern is not only listening to the voice of customer but also harmonizing voice of finance, technology and marketing departments and adding value to their processes. In order to support these assumptions CHC will consider research concepts as Benefits Realization Management (BRM) [18, BRADLEY] and Value Engineering (VE) [19, DELL'ISOLA], which might increase cross functional integration between marketing, engineering and manufacturing [20, PAGE, 21,BARCZAK].

CHC focus on innovation-related value measures and communication of these values leads to increase user-knowledge and collaboration, develop alternate solutions and reduce unnecessary costs. This can be facilitated by collaborations through creating effective knowledge transfer both in theoretical background and application of case-based learning methods. Collaborative high-tech B2B marketing capabilities, between INNOVMAT and CROSS BORDER HIGH TECH CENTER (CHC) (see project N00092), provide learning approach to support market entry of innovative engineering materials.

3.4 High Tech marketing knowledge collaboration through MDC, MTB, MARKETABILITY

When organizations are approached from a knowledge-based perspective, one of the key issues of concern is how to integrate the disparate knowledge of individual organizational members into products, services, processes and routines that benefit the organization as a whole [22, POYHONEN].

In terms of new research activity, attention moves from the purely academic to a more collaborative process [23, CHIA]. Currently, the universities have being implemented the changes of the innovation pattern from the “knowledge factory” model to the “knowledge hub” model considering multiple networks [24, CARAYANNIS]. Knowledge flow and networking among enterprises, universities and, research institutions are essential for promoting of high-level innovation and knowledge [25, AUDRETSCH]. Knowledge transfer procedes more effectively toward the common goal by collaboration. The collaboration management cycle that is applied for creating community includes four phases: collect interaction data, construct a model of interaction, compare the current state of interaction to the desired state and advice or guide the interaction [26, SOLLER].

High tech B 2 B marketing projects require knowledge to flow through various fields such as; technology, marketing and finance which make the smooth flow of knowledge a big challenge and create knowledge fragmentation. From a knowledge transfer perspective this is one of the most important aspects, as many projects run into problems. As a result building common standards and a language to enable knowledge transfer within a community is a need [27, CIBORRA]. Clarity of knowledge transferred becomes essential requirement to ensure an operation will lead to the desired result. This raises the question of equal understanding of knowledge objects by all actors involved in a collaborative activity, each one having their own contextual sphere of interpreting a unit or set of information.

In order to create effective knowledge transfer, knowledge collaboration and common language / standard INNOVMAT and CROSS BORDER HIGH TECH CENTER (CHC) apply Multidisciplinary Communication (MDC) in B2B marketing, which is an effective communication between engineering and marketing. The partners who belong to different knowledge disciplines exchange their views on content from different disciplinary viewpoints [5, HASENAUER]. Thus MDC has competencies in learning and collaborating with entrepreneurship, education and technological development at the same time.

Another approach in CROSS BORDER HIGH TECH CENTER (CHC) is Marketing Test Bed (MTB) which is a multidisciplinary, experimental approach in B2B marketing to support market entry of High-Tech Innovation based on qualitative market research procedures such as problem-centred interviews and focus groups. The MTB configuration uses community-based innovation (CBI) and open innovation (OI) [28, CHESBROUGH] approaches and applies technology acceptance (TAM) [28, CHESBROUGH, 29, DAVIS] Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology [30, RATCHEVA], technology resistance models [31, RAM] and window of opportunity [5, HASENAUER].

Finally Marketability approach is the basic requirement for economically viable high-tech innovation and it strongly depends on the communicability of the innovative features which are demanded by the addressed customer target group. Marketability criteria of high-tech innovation can be described by: Innovativeness, Testability, Controllability, Compatibility, Implementability, Assimilability. In B2B marketing evaluated criteria C1 to C6 heavily influence companies' purchasing behaviour and the buying decision for a high-tech innovation is multi-criteria [5, HASENAUER]. Accordingly Market share and technological leadership exert influence on speed, direction and quality of percolation / anti percolation of innovation through the addressed market [5, HASENAUER].

The fields of mutual cooperation between INNOVMAT and CHC are shown in the table below:

Table 1. The fields of cooperation between INNOVMAT and CROSS BORDER HIGH TECH CENTER (CHC)

Knowledge Holders / Sources, Recipients	Knowledge Transfer Success			
	INNOVMAT	HIGH TECH CENTER		
		MARKETABILITY	MTB	MDC
Seller Buyer Competitor Marketing Technology Finance	INNOVMAT academy	Teaching criteria of marketability	Method of marketing testbed	Training of multi-disciplinary communication
	INNOVMAT contactor	Offering access to buyers and partners	Find partners for marketing testbeds	Improve MDC by accessing contacts
	INNOVMAT expertise	Check innovation half life of functional materials	Check innovative USP's with lead users	Build up efficient expertise networks using MDC

3.5 High Tech marketing as an interdisciplinary education system

The successful use of innovative engineering materials in the industry needs developers in both field of technology and marketing. In Central Europe education of interdisciplinary teams remains challenging, as the innovation development takes place in the technical research institutes and universities. The business schools are separate from technical universities, which is the case in Vienna, Bratislava and Prague. Thus opportunities for a direct cooperation were prevented.

To overcome this problem we developed a pilot education system which is targeted for integration of hi-tech and marketing topics. It is a practice oriented model in which the marketing students realize the high tech centered projects. Several innovative materials in the marketing test bed were examined, such as DLC films, Bionic layers and cellular materials.

The interdisciplinary education system has been scheduled successfully at WU-Vienna, TU Vienna and Graz in Austria Campus 02. Since 2012 it has been adapted at the University of Economics in Bratislava. It implies a structure of professional clubs; which are created to act as a common platform for marketing, developers and technician specialists [32, REHAK].

In cooperation with INNOVMAT for a group of 12 marketing students the subject on innovative materials development was presented, 3 students have taken their own thesis on aluminum foam products marketing test bed. Each thesis was checked by experts from the innovative engineering material development and marketing. The objectives are focused on the market acceptance, business model preparation and new designs.

4 CONCLUSIONS

The development, exploiting and commercializing of new technologies is absolutely essential if a company is to stay competitive in modern industrialised world. High-technology sectors are key drivers for economic growth, productivity and welfare, and are generally a source of high value added and well-paid employment. That is why the knowledge transfer from scientific institutions and universities to industry has become one of the key priorities for policy makers worldwide. Products and services of enterprises with extremely high innovative potential are vital to the competitive position in worldwide markets because:

- ✓ they are associated with innovation and hence tend to gain a larger market share, create new product and service markets, and use resources more efficiently (environmental aspects play also very important role in this context);
- ✓ they are linked to high value-added production and success in foreign markets, which helps to support higher returns to the workers they employ;
- ✓ the industrial R&D in cooperation with research institutions and universities has spill-over effects which benefit other commercial sectors by generating new products and processes, often leading to productivity gains, business expansion and the creation of high-wage jobs [2 JERZ].

The mission of knowledge transfer platforms INNOVMAT and CHC is therefore to ensure an increase in the efficiency of the transfer of R&D results so as to achieve a maximum benefit for the region. The activities of both platforms are systematically focused preferably on development and commercialization of innovative products with extremely large potential to achieve particularly high added value thanks to effectively utilized know-how because the sustainability of products and processes is a major challenge for the nearest future. Transfer of knowledge is an important function, which requires the professional management. This function must be adequately secured by resources, by a long-term commitment of providing an access to the necessary funds and expertise.

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