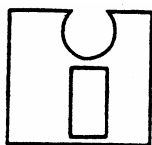


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THE COST OF PROTECTING INTELLECTUAL PROPERTY IN THE
PROCESS OF COMMERCIALIZATION

ENTREPRENEURSHIP AND THE COMMERCIALIZATION OF INVENTIONS AND
RESEARCH RESULTS BASED ON A NUMBER OF POLISH EXPERIENCES
(IN A COUNTRY IN ECONOMIC TRANSITION)

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SUMMARY

1. Innovativeness, creativity and progressive thinking in itself are nothing more than a demonstration of intellectual possibilities. However, the commercialization of inventive creativity, specially in enterprises and economic organizations, is the principal basis for their progress, growth of competitiveness and improvement in quality of life for societies and nations. Professional organizations, such as SPWiR in Poland, help in relation many innovative activities, introducing a synergy effect, and are beneficial for innovators and for director and indirect users of their "products." The present description is based on three successful examples of commercialization of proper inventions and the subsequent continuous improvement or innovative, creative development of resulting solutions. The first firm "MEDCOM" was established by a group of young scientific employees, from the Warsaw University of Technology, the best university of its kind in Poland. Commitment and personal conviction allowed them to get through the most difficult times and to progress slowly using managerial knowledge, so much at the start. The second firm "VIGO" is based on the exceptional invention of one person, who gathered around him the group of specialists that began production, followed by links with international distributors and the global commercialization of funcooled infra-red detectors. They established a spin-off company derived from the Military University of Technology, which offers a very strong possibility of "transformation" for the military sector in central and eastern European countries. The third example is based on an innovative process devised in the State-owned Institute of Heavy Organic Synthesis, R&D sector, where the sale of licenses to South Korea also (and to other countries) was recently a significant source of income and profit for all employees. The general conclusion even demonstrated different aspects and all points of view to be taken into consideration.

FOREWORD

2. What kind of value does an invention or innovation have? From an economic point of view it is a potential value only. The presentation of an idea, even a particular solution, really demonstrates the potential economic possibility only, but not an economic fact. At that precise moment, the actual value of an innovation is really still zero or nothing. As a result, it needs prior definite evaluation in case of its potential commercialization. Commercialization is not, however, automatic. Even the registration (patenting) of an innovative idea does not guarantee market success. In practical terms it forms the cost for the innovator (patenting fee), without profit or income at this stage of his/her activities. Innovativeness, creativity and progressive thinking in itself, are nothing more than a demonstration of intellectual possibilities. Only the commercialization is economically effective, leading to an improvement in general and particular sense.

3. From a different point of view, the new ideas, concepts, proposals and other solutions constitute very significant sources of the economic growth for individuals, new firms, other companies or organizations, and also localities, regions and countries. They are therefore very strongly promoted in developed countries, which not only understand this relation but practically support such performance through proper official structures, especially in the case of individuals and small medium-sized firms. Larger concerns or companies have proper R&D centers and do not generally need additional assistance. This scheme does not function appropriately in underdeveloped countries or in so-called emerging or economic-transition countries. In many cases they have intellectual possibilities, but no funding or managerial experience to establish, for instance, spin-offs for similar firms. In addition to this observation

we can find good examples of this kind and conclude in analytical terms, what features, foundations or causes allowed them to succeed even in such difficult conditions.

4. This can be used even as a good lesson for more interested parties, considering the new challenges in the global economy and the increasing role of the “technology management” area: what does “effective management with and for technological changes” mean? Why do some people (or teams of people) achieve success in commercialization of certain innovative ideas and others do not? How can in this respect a National Association of Inventors or similar organization help? Is it possible, if we sometimes consider such associations as specific labor unions for inventors and innovators? Here we should explain the very great difference between the implementation of an invention and to commercialization. This corresponds to the idea “product out” as opposed to the concept “market in.” We are convinced as regards the latter concept, due to beneficial effects.

AN INNOVATIVE COMPANY – BARRIERS TO DEVELOPMENT

5. If we try to make a SWOT analysis (Strengths-Weaknesses-Opportunities-Threats) under Polish conditions (a country in transition) for an innovative company, in most such companies, the analysis should resemble the table below [1]. This SWOT analysis may be typical for the first stage of development of an innovative company in any location.

Strengths	Weaknesses
Wide knowledge in specific areas Single player enterprise – low costs of R&D High flexibility Customer oriented solution	No “hard” assets or low level thereof Single player enterprise – not keeping distance from own mistakes Low level of knowledge of economic processes and methods as regards company management Entrust to “good angel” of external financing sources (such as State Committee for Scientific Research - KBN, etc.)
Opportunities	Threats
Expensive foreign solution No internal competition Marginal costs of R&D	Production capacity barrier Unwillingness to share success with others

6. There is no doubt that the biggest advantage of innovative companies is a wide knowledge of specific areas of science, in most cases based on the previous scientific activity of founders of companies. Usually, it is “one player” companies that are an advantage on the one hand and a disadvantage on the other, because no distance is kept from their mistakes. Also it is such companies which offer “customer oriented solutions.”

7. Generally in such companies there is no competition between domestic manufacturers, but foreign competition is expensive. The main source of foreign competition lies in large international organizations where the high cost of developing new products is combined with small-scale structural flexibility (Elephant – Antelopes Syndrome).

8. In wildlife elephants coexist with antelopes. Elephants dream about the speed and weight of antelopes and antelopes dream about the strength of elephants. This is similar to

the coexistence on the market of huge organizations dreaming about the flexibility of small enterprises and small companies dreaming about the strength of big organizations.

9. Low-level knowledge of operational and strategic management is a typical feature of innovative enterprises. The basis for company behavior on the market is "the basic instinct." Those companies do not accept estimates given by external organizations, even if it is needed.

10. The big disadvantage of such companies is the low level of working capital. From a distance, when the day when orders must be met is coming, two barriers are created simultaneously. One is financial – companies have no money to start manufacturing, and the second barrier is one of manufacturing capacity, where a company is not prepared to increase orders. In most cases, at this moment the process of bankruptcy or process of closing down the company begins.

11. Quite often the founders of companies expect financial help from governmental organizations such as the State Committee for Scientific Research (KBN in Poland) or others. When such help arrives, sometimes it is a question of "delaying the agony" of the company, caused by the normal bureaucratic long-lasting administrative procedures [1].

"MEDCOM Ltd." – A case of technological university to industry and the international market

12. MEDCOM Ltd. was established in 1988. The founders of the company were a group of young assistants from the Institute of Control of Industrial Electronics (Warsaw University of Technology) [1]. The main reason that the founders did this was as a response to a drop in wages and a decrease in cooperation between the university and industry. The founder expected low added value for incomes.

13. From the beginning the company was directed itself towards manufacturing UPS and a backup system for the rapidly increasing PC market (incl. computers for medicine). Until 1993, the main source of incomes was the UPS system for the PC market. The company was searching for new products since 1993, until it developed more than 40 different products, but most of them were only short series. That period was very important for the company because it had learned to be flexible and the method of using products for manufacturing purposes quickly.

14. In 1992, the company developed battery-charging systems designed for industrial and power sector applications. Thus this product has a "star" rating as the company's main product. Over the next ten years the financial and market strength of MEDCOM Ltd. grew and, so far more than 250 designs have been developed (70 of them unfortunately only to stay on the shelf), designed for four markets: power sector and industry, traction equipment (3000VDC, 600VDC), military production and export. MEDCOM Ltd. currently employs 48 people: R&D – 16 people (six with Ph.D. Eng. title); direct production – 19 technicians; production support – seven people; administration – three people; and sales department – three people.

15. The board members are active, in addition to their board duties, they currently belong to departments. Some production employees are outsourced up to 10 people. The company is certified with the ISO 9001 quality management standard (the system was first applied in 1996). Gross Profit Margin is 5% – 10% of turnover. Accumulated capital is over three million zloty (for comparison, approx. 1 USD = 4 zloty).

16. The company's task, which has been created "by the way," is "to search and place its products in market gaps – niche production or custom design." Most of the products use the latest technologies in the field of power electronics. Market trends are investigated by such tools as:

- (a) the Internet;
- (b) specialized international fairs overseas;
- (c) subscriptions worldwide specialized papers;
- (d) observation of trends in large international organizations.

17. One of the important elements of the strategy of a growing innovative enterprise is the need to reduce or control the speed of growth. Year by year turnover has increased for the past ten years. Only in 1999 was there a 5% decrease turnover on the previous year. One of the most important reasons for the economic success of MEDCOM Ltd. was the decrease in the speed of company development. Whenever the company cash flow was positive there was an increase in orders. Whenever the cash flow was sensitive, orders decreased. Twice in the company's history attempts were made to reduce the company's speed of growth. First in 1994 and then in 1998.

18. On these second occasion it was also the unforeseen effect of decreasing orders in 1999, owing to the unfavorable market situation. The methods of self-limitation for the company were constituted by traditional market behaviors such as excessively high prices, long delivery period, etc. In addition to that market activity, internal company restructuring was provided mainly to increase production capacity (see Fig.: Market structure of MEDCOM Ltd. in 2001).

19. There is no universal recipe for any innovative company and every case is individual. In Poland there are no regulations for support and stimulating innovative companies. Banks or other financial institutions must be influenced so as to provide a mechanism for financing innovative companies. First, such financial organizations should have the ability to calculate a "credit risk," and secondly, to support innovative companies in applying the methods for their effective management. All these companies have a higher "credit risk." Only certain innovative companies had the opportunity to celebrate financial success, but the majority of them are still "on the way up to the hill," if they haven't already disappeared.

"VIGOLtd." – New case of generation of infrared detectors – From idea to commercialization

20. Proper enterprise location in the new economy reality has become a major problem not only for state owned factories and general managers, and R&D institutions, but also for newly created, privately owned enterprises, seeking a place in the market [2]. It is not easy to find one's own way in complicated economical and political conditions. Joining – as partners – the countries which have long lives in free, worldwide open market, ruled by strict competition laws, lead to the occurrence of many errors. There is demand for a change in long-standing habits, relations to the customer and own work, and a need to find gaps in the worldwide syndicates market. It is particularly difficult today, in conditions of very strong

capital concentration, and the broadening of worldwide economic processes and simultaneous capital deficiencies.

21. At the beginning of the 1970s, in WAT (Military University of Technology in Warsaw), Professor Piotrowski's team – at that time a doctor of technical science – the know-how was developed for uncooled, infrared photon detectors. These detectors produced – owing to the lack of the need for cooling with liquid nitrogen (ca. -170°C) – created a new wide application range for IR process engineering, not only for military applications, but also in very many civilian ones. Information concerning the new type of IR detectors developed in Poland, and publicized in scientific literature, was met with incredulity at that time – both in the West and East.

22. In relation to the main domestic electronic industry level, this invention was ahead of its times. Apart from announcements in strictly scientific literature, Western countries were cut off from a number of technical data and commercial information. Polish foreign trade was concentrated in a small number of authorized central trade institutions, where experts, who could provide a skilled opinion were lacking. An unrealistic US\$ exchange rate, connected with strictly controlled access to foreign currencies, made the start of promotion activity impossible – without State authority approval. Lack of access to the market made it impossible to sell products, and therefore generated a lack of financial means for quick development.

23. Market success first occurred in 1980, when at the Boston scientific meeting CLEO'80, following the presentation of papers, private contacts were created with a US wholesaler. The distributor took a risk in promoting Polish detectors in the US market. The existing reality very quickly meant that initial plans were verified. Very strong economic recession in Poland, and related lack of financial means, meant that in 1990 the termination of the States order led with good reason, from an independent VIGO, to the establishment of a cooperative. Owing to certain market opportunities, and a small number of foreign orders, the cooperative has – with very great difficulty – survived, by financing R&D activity with its own means.

24. VIGO Ltd. or VIGO Systems Ltd. is actually a small-scale, fully privately owned enterprise, dealing with R&D and implementation mainly of its own technical solutions and devices, in optoelectronics, with advanced know-how. The core team of people consists of highly qualified experts (one professor, seven doctors of technical science and 15 engineers) and currently employs about 50 people, mainly highly qualified technicians. The basic part of the firm's income is from optoelectronic, electronic and optical devices, and the sale of other sub-assemblies, mainly the firm's own products – based on its own inventions and know-how.

25. Approximately 50% to 70% of the firm's production is in developed countries' market trade. Its cooperative VIGO Ltd. engages 16 wholesalers worldwide, on a global scale. Its main foreign market is in the USA, Canada, Germany, Japan and Great Britain. The firm's employees maintain close connections with domestic and foreign scientific institutions, as expressed in the exchange of experiences, commonly executed research works, papers, and scientific practices. Polish universities have sent their students to the firm for practice and thesis preparation. (*The first ever uncooled infrared radiation detector 10.6 μm, invented by the Polish firm "VIGO Systems Ltd.": photoresistor; photo-magneto-electric detector*).

MANAGEMENT REORIENTATION TO A MARKET ECONOMY

26. The VIGO -Systems management has applied adaptation means to the new economic conditions. The best patterns were taken into account, starting with management studies, organized by INSEAD –European Institute of Business Administration in Fontainebleau, near Paris, France, followed by postgraduate marketing studies, and staff training courses. The knowledge gained provided an entirely new perspective for market economy problems. Not only the approach to management affairs, production control, staff management and distribution of resources has changed radically.
27. The firm's aims were radically re-evaluated, together with the methods to achieve them, financial calculations, and presentation of the firm's financial statements, as well as a hierarchy of tasks in terms of their importance. Marketing importance was assessed, and adequate steps were undertaken to adapt the firm's tasks to market demands. In contrast to the previously applied, "pro-product" firm organization, tasks are now directed to "market oriented" activity.
28. Significant features of market-oriented activity are management, research, trade, development and production –from the organization process to the submission of customers' requirements. In this case the key problem is achieving perfect market requirements – competitors, knowledge and the anticipation of new needs and creation of abilities. At the company's world trends meeting, the Quality Management System based on the ISO 9001 Standard was implemented.
29. Products without quick sale perspective production were eliminated. Actual production was exclusively for orders submitted, so that a stock of real products would not be accumulated. The storage rooms for raw materials, sub-assemblies and spare parts was removed and production is based on current deliveries, ordered on the basis that materials go directly to the production line. The services of the State Foreign Trade Office were abandoned, and the firm's own trade office was set up through complex customer attendance, product promotion and technical advice provision.
30. The firm's trade office also engages in brokerage trade with optoelectronic devices and sub-assemblies from renowned Western companies. Intensive surveyors' efforts were undertaken to find a new mass-market product while ensuring regular sales. Last but not least, with great courage, the firm aims to promote itself in foreign markets through large fairs, participation in exhibitions and world wide specialist professional magazines publishing advertising information.
31. In an innovation company, with a homogenous and limited product range, one of the biggest problems is maintaining a financial liquidity, when an attempt is made to conquer the market and long term orders are not available. This is connected with the specific product development and market life cycles. The problem is more serious, when the company's products are a real novelty at the global level, and its market acceptance is connected with the need to convince customer to purchase and also a certain amount of didactic work and to inform them of effective methods for the exploitation of new product parameters.
32. As our own experience teaches us, supported by wholesalers' opinion and research results, the introduction of a new product (when it is really a new product) into the market takes two to three years. For innovation companies, in Polish conditions, that means a need to find funding sources for scientific research, R&D and product promotion, but outside the

banking system. In practice, this means that there is a need to find sponsors or to undertake additional, profitable trade or service activity, and with its help, live through difficult times.

ICSO Institute of Heavy Organic Synthesis “Blachownia” – Case of Processes of an epoxy resins combine, implemented in Poland, Korea, etc. by R&D chemical institute on the international, worldwide market

33. Chemical processes for manufacturing bisphenol A, allyl chloride, epichlorohydrin and epoxy resins constitute the Epoxy Resin Combined developed and implemented by Polish inventors from the Institute of Heavy Organic Synthesis (ICSO – Instytut Ciężkiej Syntezy Organicznej) “Blachownia” located in the small city of Kędzierzyn – Koźle, southwest Poland, and other companies cooperating with this institute. [3].

34. The company PetroCarboChem Synteza S.A., at Kędzierzyn – Koźle produces bisphenol A (12000 t/y), the company Zaksady Chemiczne Zachem at Bydgoszcz (northern Poland) produces allyl chloride (33000 t/y), and the company Zaksady Chemiczne Organika Sarzyna at Nowa Sarzyna (southeast Poland) produces epoxy resins (12000 t/y). The processes developed by ICSO inventors are very competitive in relation to leading world chemical companies.

35. This novelty and the advantages of the processes were grounds for the successful provision of bisphenol A licenses for six foreign companies, an allyl chloride license – for Samsung Fine Chemicals Co. (South Korea), and recently a bisphenol A and epoxy resins license – for Salzgitter Anlagenbau, but its plant located in Iran. Sale of the licenses generated income of many millions of dollars. All products are used in many industrial sectors.

36. At the present moment, the allyl chloride and epichlorohydrin processes enable high purity products to be produced on an industrial scale: allyl chloride more than 99.3% pure and epichlorohydrin more than 99.9% pure, with low consumption of raw materials and utilities. In that connection a 30,000 t/year plant, erected at Ulsan, South Korea and based on the Polish basic design package, was put on stream in 1999. All the consumption factors guaranteed by the ICSO “Blachownia” and “Zachem -Bydgoszcz” have been achieved (see photo above).

37. The Institute’s inventors have been conducting studies intended to improve the ICSO’s own process. For several years the ICSO has been cooperating as well with the Purolite Company (Great Britain) and with the Sulzer Chemtech Company (Switzerland) in the areas of ion-exchange resins, and crystallization and distillation processes respectively. Both the inventors and the ICSO Institute are members of the Association of Polish Inventors and Rationalizers (SPWiR). So they also try to promote their inventions.

FINAL OBSERVATIONS, CONCLUSIONS AND RECOMMENDATIONS

38. In general, apart from the successful examples presented above, an innovative conception for a new product is still little nowadays in terms of conquering the market and enhancing future prospects. In open market conditions, with free access for all producers around the world, it is necessary to consider promotion, based on marketing studies, mechanisms governing customers’ behavior, steady research into process engineering changes, and R&D work execution, so as not to lag behind.

39. It is obviously impossible, in terms of national industrial potential in a country the size of Poland – to build at grass roots level intensities of thousands of innovation companies, where each can find its own technological niche. There should anyway be a strong development trend and sponsorship for innovation firms, as well as the removal of barriers to technological progress.

40. Support for this argument lay in the existence of MEDCOM and VIGOLtd., which have survived difficult times during the period of economic reconstruction in Poland, as a result of substantial expenditures for R&D studies and their organization of management rules. A significant note in a firm's maintenance on the world wide market is played by new trade, production, and a public relations organization philosophy. An experiment in transferring a firm – from a product-oriented to a market-oriented approach was fully successful here. The biggest world wide wholesalers are interested in selling products. The producers of modern devices, invented and manufactured in Poland, are still growing.

41. It is difficult to imagine that someone can achieve success on the free market, without respecting the rules that are obligatory there. This is particularly important for small market participants, which have extremely limited room for maneuver, in relation to the need to find technological niches, with limited financial means. In Poland, in the improbable legitimate disorder created over time, and the clash of ideas created by stated duties, these small innovation companies have stood together.

42. This was a very difficult situation, mainly for those institutions whose activities are on the one hand – rather risky, but on the other hand – very important for the State. Industry traditionally adapted itself to mass production, as its natural disposition lay in a great inertia towards production, and to the introduction of novelty, where process engineering changes are essential. This seldom exists in large-scale industry, as production occurs in small innovation companies. But for effective activity in these firms, in most cases, state or industry sponsorship is needed.

43. The process of devising financial means for company activity and indispensable R&D studies designed to achieve market success are connected with surpassing a certain critical mass, which is impossible in relation to self-financing. Execution of marketing research, where this is executed adequately, is usually beyond small company capabilities, but it is the basis of sound investment. In small Polish companies the major part of investment is decided intuitively. In R&D institutes correct adaptation to a new situation is mandatory. Success depends on market orientation and real official industrial policy.

44. But the state and industry have not still devised a mechanism for engineering, the utilization of the intellectual potential of staff, and for small innovation company sponsorship. This is strongly recommended. Expectations that innovation enterprises should be self-supporting, working at their own risk, without capital support, demonstrate a naive view, as the view that Uncle Sam will come in with a sack of dollars and everybody will make business together [1,2,3].

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