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Marketing of New Technologies and Products – Perspectives, Challenges, and Actions

Summary

This paper explores some of the challenges of marketing technology based products, cites some examples, and offers counsel for management action. Globally, technology based organizations must confront three major scientific and technological trends: the exploding annual increase in R&D investment and the relative number of researchers, the globalization of scientific and technological knowledge, an accelerating rate of scientific and technological knowledge diffusion. This section comprises the foundational base of marketing of new technologies and products. The new technology advancements destroy current products and markets while simultaneously creating new products and markets opportunities. The paper presents some perspectives on new technology innovations and products and related marketing issues. Examples from Poland and the USA will be cited.

Key words: marketing of science, technology and knowledge, high-tech marketing.

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New technology development – Theoretical context

The increased R&D investment funds an increasing number of researchers is a world tendency. On a global basis since 2000, the worldwide investment in R&D is approximately 2% of the world economy which is forecast to increase to 2.5% by 2018 – a 20% increase. In 2000, there were approximately 1083 researchers worldwide per million populations. In 2018, there will be approximately 1440 researchers worldwide per million population – a 33% increase (Zehner, Pletcher 2017). New knowledge creates even more knowledge but an accelerating rate.

The globalization of scientific and technological knowledge is as likely to be found in Asia or the USA as in Europe. China is currently ranked number two in scientific publications behind the USA. The World Bank reported in 2000, there were approximately 974 thousand scientific and technical articles published globally. Zehner & Pletcher (2017) forecast there will be approximately 2.700 million articles published in 2018 – a 2.77 fold increase.

An accelerating rate of scientific and technological knowledge diffusion is the third major scientific and technological trends. Patents may be conceptualized as scientific and

technology knowledge which may have economic value in the near future. In 2000, approximately 1.271 million patent applications were filed worldwide. In 2018 approximately 2.750 million patents application are forecast to be filed – an over two fold increase (Zehner, Pletcher 2017).

These three trends are redefining organizations, competitive advantage, and as well as the markets themselves. The managerial task has become and will continue to become increasingly complex as knowledge shifts force management to address the existential questions such as:

- What new technologies should we invest in?
- Where do we find the technologies to maintain our competitive advantage?
- What employee skills do we need to productize the technology?
- Which markets should we compete in?
- How should we compete (value proposition)?

Servet (2011) point out that technology development has significant relationships with many non-technological factors in its knowledge and economics ecosystem; technology develop also affects the relationship of these components with each other. The authors recognized following factors of innovation ecosystem are significant in influencing the new technology development of commercial organizations: *governmental R&D funding, the intrinsic complexity of science and knowledge itself, governmental innovation policies and regional policies to transform knowledge into new products and services and firms, the capacity of a firm for innovation, the processes of commercialization, access to sources of financing, qualified human resources and appropriate marketing management and processes.*

Government funding in most countries enable universities to perform basic research to advance science. Robert Solow received the 1987 Nobel Prize in economics for his insight that science and technology innovations are responsible for approximately 87.5% of world's increases and standard living. Solow (1957) concluded, "It is possible to argue that one-eighth of the total increase [in wealth] is traceable to increased capital and man-hours [labor], and the remaining seven-eighths is due to technical change". It is ultimately science and technology which increase a nation's standard of living. Science and technologies are transformed into new products, services, and companies. In addition to funding basic research, government also provides support for applied research crucial for product development in sectors such as defense and space development (Dorf 1998).

The knowledge ecosystem is highly dependent on a governmental economic policy directed toward the development of small and medium-sized innovative enterprises which catalyze commercialization of new technologies. Within the context of an overall economic policy, both governmental and nongovernmental agencies need to develop a technology policy to stimulate teams of potential entrepreneurs prepare to compete in the global markets.

Any analysis of the infrastructure influencing the development and commercialization of new technologies must also take into account regional policies. Morgan (1998) identifies science and technology policy as: government plans, programs and initiatives in support of science and technology developments.

The capacity of a firm for innovation depends on the firm's ability to both recognize and assimilate new knowledge which enables new product development to increase competitiveness on both local and international markets. This capacity is characterized by an internal ability to apply new technologies by fostering a culture of innovation to create products desired by customers. The major challenge is the applying innovative methods of management and organization which embrace absorption and application the know-how - especially know how generated by outside the organization to overcome the NIH [not invented here] factor for knowledge generated outside a firm.

The rapid increase in the complexity and fabric of science, knowledge of innovation techniques, and the rapid market fluctuations – both in terms of supply and demand – increase the risks, and in particular the costs, associated with creating economic activity (Stawasz, Mertl 2005). As pointed out by Nevens, Summe, and Ustal, the economic costs associated with the development of new technologies are large and growing. There is a pressing need to alleviate, at least in part, the burden of such costs on firms by spreading it across society (Nevens, Summe, Ustal 1995). For example, California, Massachusetts, and 40 other US states have funded organizations to foster bioscience research.

The conduct of scientific and market research into new technologies to create new products is characterized by a global outlook and global network of innovators (Zehner, Trzmielak, Gwarda-Gruszczynska 2010). In order to make develop new technologies and new products possible as rapidly as possible, a significant element is a knowledge infrastructure of international contacts among researchers. The ability to rapidly enter a market is closely connected with the technology commercialization process which begins with an assessment of the marketing opportunities for a particular product or service and ends with their sale to end users. This process is difficult, ultimately dependent on the economics of the target market, and can take several years.

At the end of theoretical discussion the marketing management and services will be consider as the significant factor for new technology development. Marketing management and services help with customers' value creation by developing innovative technologies and products and then marketing the products. If the products fail to offer the customers significantly more economic value than customer's current solutions to needs, the new products are not innovative and will fail in the marketplace.

Some technology trends impacting marketing

One of the major technological trends is online marketing. In the US and Europe, online sales continue to explode. In US more people chose to do their shopping online than at physical stores (Kaplan 2017; Pattabhiram 2017). DeMers (2017) forecasts that the trend towards cyber shopping is likely to accelerate due to new technologies which are enriching the "on line" shopping experience. Technologies supporting social media coupled to artificial intelligence analysing "big data" to create customer profiles which enables firms to create market segments of "one" at the individual level.

In 2014, Stanford University launched a multi-million USD study of Artificial Intelligence (AI). In 2016, Stanford University issued its first report on AI, which forecasts the impact of AI on eight industries. The most immediate impact of AI is likely to be on the transportation

“Where a few key technologies have catalysed the widespread adoption of AI with astonishing speed. ...Autonomous transportation will soon be commonplace... As cars become better drivers than people, city-dwellers will own fewer cars... In the typical North American city in 2030, physically embodied AI applications will not be limited to cars, but are likely to include trucks, flying vehicles, and personal robots (AI100 2016)”.

Table 1
Technology Trends in the Impacting Marketing

Marketing Dimensions	Technologies / Trends	Major Technology Issue	Marketing Implications	
Strategic Marketing				
• Segmentation	Big Data, Predictive Analysis, & Artificial Intelligence, Return on Sales	Enterprise and Customer Protection systems cuts across all digital based technologies Cyber security and recovery	Creation of customer segments Market segment of “one” Identification of most economic customers	
• Targeting	Predictive Analysis, Analytics, & Influencer Analysis, International competitive		Rank ordering of market segments to target to maximize ROS Defining purchase behaviors within marketing segments	
• Positioning	Big Data. Competitive Analysis, Predictive Algorithms, Artificial Intelligence		Development of optimal positioning strategies and related messaging relative to competition	
Tactical Marketing				
• Product	3D Printing, Rapid Customization, Manufacturing by robots, Minimization of particles		Products tailored to a specific market segment Rapid delivery Lower costs	
• Price	Big Data, Analytics,		Customer value analysis Variable pricing based on time of day / month/ and demand	
• Promotion	Videos, Augmented reality, Virtual Reality, Personalized Visualization		Total engagement promotion incorporating the customer	
• Physical Distribution	Multiple warehouses, Predictive Analysis, Artificial Intelligence, Drones	Same day, Next day delivery, Paid “returns”		

Source: own work on literature.



In November, 2017, General Motors announced it wants to bring self-driving cars to big US cities in 2019 based on its electric Volt model. Ford Motor has a comparable plan targeted for 2021. The objective is a system of “zero crashes, zero emissions, and zero congestion” while simultaneously reducing the cost of ride sharing services (Jenkins, 2017; Lohr, 2017)¹. The Polish electric vehicle start-up Varsovia Motor Company is now planning to produce a new electric sedan after 2018. The biggest innovation focuses on automatic recognizing of passenger’s emotional state ² which will ultimately determine the technologies acceptance. In only 15 years, autonomous cars will catalyse a major transformation of the basic economic structure of the US. The dissemination of autonomous cars throughout the US will be twice as fast as electric motors which underscore the rapidity of a new technology’s impact. More importantly, the autonomous car product will transform the entire US automotive economic structure. Additionally, if more and more citizens’ give up their cars completely to “Uber” across cities as many of the millennials are doing, the abandonment of individual cars will catalyse rapid restructuring of automotive marketing product development and related promotion. Will the customers for autonomous cars become corporations who are managing “ride sharing – self driving” services vs. today’s individual customers?

Technology trends in the international impacting marketing are presented in table 1. Note bene that technology impacts all the elements of marketing at both strategic and tactical levels.

Marketing of new technology and products – American and Polish views

There are many issues which complicate the marketing of innovative technology products. The new technology product is normally “better, faster, and cheaper” than the current status quo solution to the customer’s “pain”. Developing an innovative technology based product is challenging. Both Hansen’s (1995) and Stevens and Burley’s (1997) research points out the probability of market success is low – in the 3 to 5% range depending on the industry and product. The costs are high to develop the product and launch the new technology product in the marketplace are high. Jolly (1997) concluded in *Commercializing New Technologies*, that it costs approximately 1 economic unit (\$1 US) to develop the idea, 10 economic units (\$10 US) to create the prototype, and 100 economic units (\$100 US) to launch the final product in the market place for a product development economic unit ratio of 1:10:100.

How to improve the odds of success while simultaneously minimizing costs? Adams (2002)³ argues that all members – from the CEO to technologist to administrative staff - of the new venture team validate the market by personally interviewing 30 potential customers. The market validation is too important to be left to the marketing department. Having the entire team participate in the market validation dramatically improves the probably that

¹ From \$2-3 USD a mile to well under \$1 USD a mile.

² <http://www.varsoviaconcept.com/#innovation> [access: 09.12.2017].

³ Former venture capitalist and currently an entrepreneurship professor at the University of Texas.

product offered will address customer needs. Potential customers will purchase only when they are convinced the new product can solve the pain of their problem. Moore (2002) identifies approximately 2% per cent of potential consumers as early adopters. The question for marketers is how to identify the early adopters and what information do they need to make a positive purchase decision?

One significant trend of new technology and products development is that they are less energy intensive, waste-free or low-waste, cheaper and more effective, and less polluting. However, product innovation is often costly requiring significant economic investments with the high risk and uncertain sales. The earlier marketing is married with technology the higher the probability of commercial success. The introduction of marketing is inevitable in laboratories at the beginning of new technology development stages increases the odds of market success. Marketing at the earliest stages of R&D exploration creates the opportunity for focusing the research on possible market applications.

A Polish cosmetics company, Eris, develop a line of products containing substances with the structure and function resembling those of natural estrogens. A few consumers are interested in natural estrogens but many individuals want to protect their skin against intrinsic aging. The market benefits strongly indicated the new products are especially beneficial for women during menopause as “anti-aging” cosmetics.

Developing an innovative technologies and products is challenging and may be created by research and development institutes – “non-market” organizations. Scientists from Łódź Technical University found a unique bio cellulose structure with active compounds. They developed worldwide unique production technology for BOWIL Biotech which meets the pharmaceutical needs and standards. The marketing tasks adapted technology to the target market coinciding with industry requirements and needs: much faster and better skin penetration in the skin to restore aging skin (Trzmielak, Bergier 2017).

Over 110 innovative solutions for decarbonising EU transport were submitted for the European Transport Innovation Challenge 2017 (Mobility and Transport 2017). Most of the 110 innovative solutions will never be introduced to the markets. International promotion and branding are a strategy for company development based on new technology. Solaris Bus & Couch Company sold five times more products internationally than nationally. Adopting new technologies to Solaris buses and coaches to reduce emissions, lower operation costs, and reduce noise enabled Solaris become an international company. Solaris Urbino electric bus benefits are discovered by many local governments globally. The Solaris Urbino electric was named “Bus of the Year 2017” in Hannover Transport Trade Fair.

Marketing of high-tech products development need multiple human talents to achieve success. Inventors who see the technological possibilities and/ or innovators / founders who see the economic opportunities. Scientists and engineers who translate technological potential into product features, and marketers who communicate economic and product benefits to potential customers.

The successful development of “PI of the Sky” project cameras has made Createch Instruments one of the fastest-growing technology companies in Central and Eastern Europe.

The professional project recognition and the outstanding know-how of founder attract wide public attention to the company. Cooperating with Institute for Nuclear Studies in Poland and Centre for Theoretical Physics of the Polish Academy of Sciences provide the highest level of space product innovation to develop K20 camera allowing observation of the brightest flash in gamma ray spectrum connected with supernova star explosion. The company project team convince the demanding international B2B customer of the product’s superior technology and related benefits.

Eric von Hippel’s research on innovation at MIT over the last 30+ years strongly suggests that 50% to 80% of innovative products come from “lead users” in technology sophisticated companies, not the products’ producers (von Hippel 2017). One strategy organizations can utilize to improve their product success in the marketplace is the creation of a new product development council of actual and potential lead users to advise the product development team. A machinery company, Leeson, in the USA had not successfully introduced a new product in 20 years despite repeated efforts. The company formed a New Product Development Council with its technology sophisticated customers to introduce three new products. Two of the three products were successful in the marketplace.

Figure 1
The Characteristics of new technology and products marketing mix



Source: own research.

GeneaMed, a Polish spin-off, focusing on the development and implementation on the market nanoparticles to fight leukaemia disease, accelerated developments of its products after creating international support board. Few of created potential products will be commercially successful when “pushed by the producers” (Derbyshire, Giovannett 2017) but likely to be successful when “pulled” into the marketplace.

Therefore, another approach to selling technology based products is to identify “lead users” in a geographic region who are highly respected by their competitors. A company which manufacturers machines to make plastic trash and laundry bags identified a “lead user” bag manufacturer in California. The company was known for its technology astuteness. The two brothers who owned the plastic bag manufacturing were the President and Vice President, respectively, of the California Blown Film Association. The machinery company cut a deal with the “lead user” company. Over the next 3 years nearly 100 blown film machines were purchased by California blown film manufacturers based on the experience of the respected “lead user”.

New technology and products marketing mix, based on the presented examples, is shown in the figure 1.

Conclusions

Digital and other technologies are transforming the US and Poland innovation processes and related marketing approaches. The digital technologies are changing the underlying structure of the USA and Polish economies. In a hundred years, the US economy has moved from agriculture to manufacturing to an information digital economy. Poland is following the same path but much more rapidly. The new digitalization of both the products and markets compounds new risks. For example, virtually all innovative companies in the US and Poland are trying to figure out the best way to address cybersecurity risks – a major impediment which slows digitalization.

Successful high-tech companies aim to create key marketing structures that scan the external environment for technologies that represent threats as well as opportunities. Once identified, successful companies acquire new technologies to improve their cost structures and gain a competitive advantage. Scientific and innovative product features can be one of the marketing strategies to achieve successful outcomes, defined as the creation of value for “lead users”. Marketing mix of new technologies and related products plays a crucial role in recognition the market structure and bridge very high uncertainty and risk to create customer trust and deep engagement.

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Marketing nowych technologii i produktów – perspektywy, wyzwania i działania

Streszczenie

W artykule zbadano niektóre wyzwania marketingu produktów opartych na technologii, przedstawiono pewne przykłady oraz zaoferowano poradnictwo w kwestii działania zarządu. Globalnie, oparte na technologii organizacje muszą stawić czoło trzem głównym trendom naukowo-technologicznym: gwałtownemu corocznemu wzrostowi nakładów na B+R i związanej z tym liczbie badaczy, globalizacji wiedzy naukowo-technologicznej oraz przyspieszonemu tempu rozpowszechniania wiedzy naukowo-technologicznej. Artykuł zawiera podstawy marketingu nowych technologii i produktów. Postępy nowej technologii niszczą obecne produkty i rynki jednocześnie tworząc nowe produkty i szanse na rynkach. W artykule przedstawiono niektóre perspektywy innowacji i produktów nowej technologii oraz związane z tym zagadnienia marketingowe. Podano przykłady z Polski i USA.

Słowa kluczowe: marketing nauki, technologia i wiedza, marketing *high-tech*.

Kody JEL: M310

Маркетинг новых технологий и продуктов – перспективы, вызовы и действия

Резюме

В своей статье авторы изучают некоторые из вызовов для маркетинга продуктов, основанных на технологии, указывают некоторые примеры и предлагают консультацию по действиям по управлению. Глобально, основанные на технологии организации должны столкнуться с тремя основными научно-технологическими трендами: взрывообразное ежегодное увеличение капложений в НИР и ОКР, а также связанное с этим число исследователей, глобализация научных и технологических знаний, ускоряющиеся темпы распространения научных и технологических знаний. Этот раздел содержит основополагающую базу маркетинга новых технологий и продуктов. Развитие новой технологии разрушает нынешние продукты и рынки, одновременно создавая новые продукты и рыночные возможности. Статья представляет некоторые перспективы новых технологических инноваций и продуктов, а также смежные маркетинговые вопросы. Приводятся примеры из Польши и США.

Ключевые слова: маркетинг науки, технология и знания, маркетинг современных технологий (*high-tech marketing*).

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