Mechanism for developing foreign markets of technology products for efficient healthcare management and medical complexes construction

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Abstract. The paper outlines the findings of an analysis of the aspects of launching innovative technology products in new foreign markets, as exemplified by the market of medical equipment, with a focus on efficient management of healthcare. The purpose of the paper is to find efficient methods of introducing and further promoting innovative products in new markets and to propose practical recommendations. The conclusions can be used for the process of architectural planning and construction of hospitals and other healthcare complexes. The following methods were applied to conduct the study: the method of comparative analysis of leading Russian and international innovation-driven companies of different sectors, specifically medical equipment production, used to identify major demand trends in the market; the case study method; the method of deduction; the method of linear regression used to develop forecasts of future demand development for medical equipment. The study has identified major factors of competitive advantages for Russian producers of medical equipment, namely, the implementation of technology systems, development of specifically tailored propositions for each individual market, establishment of partner relations with local agent companies and bringing to the market patented equipment under licence agreements. A mechanism is developed for launching innovative products in foreign markets, which includes the stage of legal regulation, foreign trade and customs regulation, promotion and marketing measures, as well as after-sales service. The paper concludes with practical recommendations on bringing technology products in external markets, which highlight the need for preliminary monitoring of similar products available locally and internationally, complex solutions and establishment of joint ventures for product promotion and public-private entities in the long run to improve the healthcare management system.

1. Introduction
The high rate of R&D spending and active adoption of advanced technologies in medical equipment development have profiled the sector as a high-tech and innovation-driven industry [Mohr, 2010; Ciani et al., 2016]. Thus, new high-tech innovative products are developed to solve healthcare issues and improve life expectancy and some of them are unique in the market. The latest achievements include endoscopic medical record systems, endoscopic modelling for reconstructive surgery, as well as equipment for neonatal intensive care [Guerra-Bretana, Florez-Rendon, 2018; Hendricks et al., 2018].

Generally, the key aspect of launching an innovative product in external markets in a global perspective is making cardinal changes in the established markets, disruption or development of new
market niches [Hauser, 2006; Hinsch, Stockstron and Luthje, 2014; Roberts et al., 2016]. The development of new innovative products using high technologies and novel solutions allows small business to compete with big companies both in sales and in terms of financial performance improvement [Sharma, 2008; Grennan, Gupta and Lederman, 2018]. However, more than 60% of all innovative technology products are discontinued at the stage of commercialisation [Cooper, 2010; Herzlinger, 2016] and the rest 40% fail to reach an efficient level of sales [Allen, 2003]. Some researchers, however, point out that failures in launching innovative products in external markets relate primarily to the factors of the environment [Hauser, 2006; Zawislak, Fracasso, Tello-Gamarra, 2018] and problems with a proactive approach in major companies [Sharma, 2008; Rajapathirana, Hui, 2018]. In general, according to a survey concerning innovative product launches in external markets, 55% of respondents believe that the main weak spot is incorrect strategy of promotion and marketing, 16% – low product quality, 10% – excessive spending on product development, 6% – production issues and 13% – other reasons [Allen, 2003; Edwards-Schachter, 2018].

The purpose of the paper is finding efficient methods of launching innovative technology products in foreign markets based on case analysis in the medical equipment market.

2. Materials and Methods

2.1. General description

The main methods of the research aimed to identify the aspects of launching innovative medical products and equipment are as follows:

- analysis of major trends in the market of medical products and best practices of both Russian and international companies of other industries entering international markets with innovative products (winning the US market by Japanese car manufacturers, international expansion by Siemens, Rostselmash AO, Mikropribor OOO);
- deductive analysis of best practices of leading Russian and international medical producers specialising in high-tech medical equipment (GE Healthcare, Philips Healthcare, Draeger Medical GmbH, Smiths Medical, Medtronic, Schwabe AO);
- identification of factors of success for medical producers and equipment suppliers in launching in international markets (specifically Asian markets) [Zhurilo, 2007; Gbadegeshin, 2018];
- modelling for demand forecasting in medical equipment based on a linear regression model as follows:
  
  \[ y = kx + b \]

  where \( x \) is a time series of the number of patients served by a branch of medical services in a country,

  \( y \) is the total of primary medical equipment units of the type required per year for serving the patients of the respective branch.

- development of an algorithm for launching an innovative product in foreign markets and drafting recommendations.

2.2. Global market of medical products: current trends

For now, the global market of medical products and equipment shows high growth rates. According to experts, by 2030, the leaders will be the USA (with sales exceeding 300 billion dollars) and China (200 billion dollars). France, Germany and India will account for almost 150 billion dollars in total. The sectors of ophthalmic equipment, devices for laboratory testing, orthopaedic appliances and cardiovascular surgery will be the largest by 2022.

The main consumers of medical equipment and products among countries in 2017 were the USA and EU countries (Figure 1).
The biggest demand in 2016 was registered for high-tech medical equipment (specifically equipment for electronic diagnostics (12%), orthopaedics (8%); X-ray (4%); respiratory therapy (3.5%); neonatal intensive care (1.5%)) [The European medical technology industry in figures] and American producers controlled a major share of the market (more than 40%). Overall, the global turnover in medical products and equipment exceeded 130 billion dollars (Figure 2).

The market of medical equipment and products grows at a rate of more than 6% per year. By country, the main players include Germany, China, Japan, Italy and the USA, however, considerable growth over the last year has been registered in the market shares of Greece (15%), Macedonia (12.5%), Kazakhstan (12%) and Bolivia (11%).

As it was mentioned above, predictions of the level of requirements for the next years can be derived from the proposed model of linear regression for forecasting demand based on the statistics of patients registered for individual departments of healthcare institutions in a selected country and the data on main equipment units purchased for servicing them. The level of spending on medical
equipment in medical institutions by the respective departments of cardiovascular diseases in the EU countries in relation to the number of patients is as follows (Table 1).

**Table 1.** The level of spending on medical equipment in medical institutions by the respective departments of cardiovascular diseases in the EU countries, thousand euros, 1990-2020.

| Year   | Spending on medical equipment | Number of registered patients |
|--------|-------------------------------|------------------------------|
| 1990   | 3.791.193                     | 5.413.203                    |
| 1995   | 5.693.978                     | 5.604.813                    |
| 2000   | 985.580                       | 5.582.202                    |
| 2005   | 22.640.292                    | 5.662.247                    |
| 2010   | 11.212.473                    | 5.848.180                    |
| 2015   | 44.323.786                    | 6.124.468                    |
| 2020 (forecast) | 53.474.879        | 7.209.396                    |

Source: European Cardiovascular Disease Statistics, 2019. European Heart Network, February 2019.

Thus, the correlation between the number of patients with cardiovascular diseases and the level of spending on medical equipment in the EU countries for the period from 1990 to 2020 is as follows (Figure 3).

**Figure 3.** Correlation between the number of patients suffering from cardiovascular diseases and the level of spending on medical equipment in the EU countries for the period from 1990 to 2020. Source: Developed by the author.

The plotted trend was used to render the following equation of linear regression:

\[ y = 56,609x + 3 \times 10^{0.8} \]

\[ R^2 = 0.7238 \]

A one-unit increase in the number of patients with cardiovascular diseases in healthcare institutions of the EU in the future will result in an increase in spending on medical equipment by \( 3 \times 10^{0.8} \) thousand euros.
3. Results

3.1. Aspects of launching an innovative product into external markets

The process of introducing medical equipment in a new market is now quite complicated and costly and involves multiple ranks of decision-making (both in terms of the structure of internal business procedures and including external opportunities).

First of all, it involves an analysis of requirements of medical institutions (i.e., their stakeholders, doctors and patients) in a context of global industry development trends.

One of the major items of spending in launching a technology product in external markets relates to intellectual property protection and completion of licensing and certification procedures [WHO Report, 2019].

Launching an innovative product in external markets, particularly in the medical equipment segment, also requires an analysis of potential risks and planning measures for mitigating them. Therefore, based on an analysis of activities of Russian and international producers of medical equipment, namely, Schwabe AO, GE Healthcare and Draegor Medical GmbH, the author identified the following most frequent risks and proposed measures to mitigate them (Table 2).

Table 2. Risks related to launching products by Schwabe AO in external markets and mitigation measures.

| No. | Risk description                                                                 | Probability | Potential consequences                                                                 | Measures to bring down risk probabilities and mitigate consequences                                                                 |
|-----|----------------------------------------------------------------------------------|-------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1   | Price increases in products supplied by monopolist producers under production plans | ☐☐☐        | Higher production costs                                                                   | - attracting reliable material suppliers, equipment and technology providers, balanced planning of all types of resources within the Single planning system, real-time implementation monitoring |
| 2   | Deteriorating solvency levels of debtors, particularly those engaged under services agreements signed by the enterprises of the holding | ☐☐☐        | Emergence of cash shortages, rising levels of receivables, untimely settlements with suppliers and contractors | - reliance on stable suppliers, - opting for optimal schemes of settlements and financial instruments, - continuous customer management, - optimal pricing policy, - ensuring sufficient liquidity, - maintaining certain levels of accounts payable owed to suppliers and contractors, - development of measures to bring down costs and gain additional income |
| 3   | Financial market stability risks                                                  | ☐☐☐        | Higher costs of servicing attracted loans and borrowings                                   | - opting for reliable banks based on optimal borrowing costs, - balanced pricing policies for finished goods, - attracting additional external funding from advance payments |
| 4   | Failure to perform resulting from underqualification and lack of staff           | ☐☐☐        | Lost income, lack of funds to support operations                                           | - measures to train and develop staff, - recruiting staff with required level of qualification, - hiring individuals and legal entities, particularly under contractor agreements |

Risk probability: ☐☐☐ High ☐☐☐ Medium ☐☐☐ Low

Source: Developed by the author based on the following sources: 2019 GE Investor Outlook, URL: https://www.ge.com/investor-relations/sites/default/files/ge_webcast_presentation_03142019.pdf (Accessed on 17.09.2019); Draeger Annual Report, 2018, URL: https://www.draeger.com/Corporate/Content/annual-report-2018-NKn9QBGSf.pdf (Accessed on 17.09.2019).

The traditionally high development profile of healthcare in the most advanced countries (the USA, Japan, countries of the EU) and considerable research potential and high technologies of
production have long positioned these countries as the powerhouses of high-tech innovative production (both in the context of consumption and production and further marketing in the local and international markets).

However, the past decade has seen active growth in the developing countries (BRICS and Asia), both in terms of active consumers and producers of medical equipment. Given the hefty potential of market development and considerable cross-cultural aspects, producers from advanced economies have to adapt to specific local requirements.

4. Discussion

4.1. Key success factors and an algorithm for launching an innovative product in external markets in the medical equipment industry

To attain successful development, market players should not only expand their product portfolios but also rely on a diversified set of strategies tailored to specific targets and market conditions. The key factors of success for medical producers in international markets are as follows:

- investment in systems of the new generation,
- expansion and reinforcement of product ranges for specific consumption cases (development of tailored propositions),
- establishment of partner relations with companies in local markets,
- marketing instruments developed and patented by leading research institutions (under licence agreements).

It was established from research findings that the algorithm for launching medical equipment in the market consists of four major stages: legal regulation, trade and customs regulation, promotion and marketing, after-sales service (Figure 4).

![Figure 4](image)

Following is the description of measures and steps for each stage of the algorithm:

1) Legal regulation

This stage consists in determining the body responsible for the legal regulation of imports of medical equipment in the target country (e.g., in India, the respective body is the Central Drugs Standard Control Organization (CDSCO)). The organisation appoints an authorised agent holding a specific licence to handle coordination with regulatory bodies in charge of medical equipment imports.
and the agent submits and registers required documents on behalf of the company. An application is filed to obtain a registration certificate of medical equipment. If the filing is successful, a registration certificate is issued, which is valid for three years from the date of issue.

2) Trade and customs regulations
This stage involves certified distributors in the target markets, filing an application for an import permit and obtaining a licence.

3) Promotion and marketing
This stage involves steps related to the direct and indirect marketing complex. The instruments of direct marketing include the search of and direct cooperation with trade representatives, agents and distributors, which, in turn, promote company products by arranging personal meetings and presentations with the following market participants:

- public clinics, hospitals, medical centres;
- private medical institutions, hospitals, clinics;
- insurance companies;
- specialised associations (e.g., associations of neonatologists, resuscitationists and pediatricians in case of promotion of neonatology equipment);

Internet promotion is arranged via placements of products in local tender sites, specialised portals for medical staff, as well as online catalogues of medical equipment.

The instruments of indirect marketing include cooperation with embassies of the target countries in the home country (engagement in embassy events, raising brand and product awareness, networking and cooperation with potential customers, PR).

4) After-sales service
Product usage process should also involve regular feedback analysis and further steps to introduce required improvements in product exploitation taking into account individual needs and demands of customer organisations.

4.2. Recommendations
Based on the analysis of practice of leading Russian and international producers in the medical equipment industry in developing foreign markets and taking into account the important existing competitiveness factors of respective medical producers (such as the establishment of competence and research and technology design centres, large-scale diversification of production, establishment of joint ventures with high-tech companies, formation of expert commissions on innovation development), the following practical recommendations can be proposed for launching innovative technology products in external markets and managing healthcare:

1. Control of the price and quality ratio based on competitive analysis in monitoring similar products locally and internationally in order to achieve competitive pricing and proper quality standards. This proposition is relevant specifically for the markets of developing countries.

2. Providing complex solutions in foreign markets:

- consultancy support during purchase and exploitation. Modular solutions can be also provided as part of mobile healthcare;
- full-fledged after-sales support and services, both on-site and on a remote basis;
- utilisation of digital technologies for the convenient and efficient operation of company products;
- training as part of service support (training, master-classes, both on-site and on a remote basis);
- education of department heads in medical institutions (primarily in the form of remote consultancy services).
3. Establishment of joint ventures under mid-term and long-term projects with international medical institutions in the target markets specialised in research and development, with a focus on the needs of target audiences in envisaged markets, which directly supports improvement in healthcare management systems.

4. Long-term, public-private entities can be established in the international market for implementing projects in healthcare, particularly through the engagement in public special-purpose programmes to support national healthcare and, in case of success, surveying the macro conditions in the country and conditions of participation.

5. Conclusion
Generally, for producers of medical equipment to make sure they achieve success in developing foreign markets, they should focus on continuous innovation processes and R&D focusing on constant improvement of ergonomics, reliability, interactive features and end-user capabilities.

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