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OPTIMIZATION OF MARKETING PLANNING AND NEW PRODUCT DEVELOPMENT PROCESS AS THE WAYS FOR INCREASING COMPETITIVENESS OF RUSSIAN INDUSTRIAL INNOVATIONS

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ABSTRACT

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Growing innovative capacity of national economies, globalization of markets and tough foreign competition make creation and successful commercialization of innovative products vitally necessary for Russian industrial companies. In particular, the given thesis studies national machine-tool industry, which differs by increased technological and production backwardness under simultaneous high strategic importance for the country. This is why it is necessary to define company-driven reasons and ways of Russian innovative machine-tools' market performance improvement. Marketing planning efficiency and optimality of innovations development process are considered to be one of the most operative ways. The given paper investigates marketing planning and the process of innovations development in the OJSC "SASTA", national innovative machine-tool producer and provides practical recommendations on their optimization. Necessary data were obtained by mean of empirical research executed qualitatively through semi-structured interview. Additionally, there was conducted theoretical study of applicability of existing innovation development frameworks in conditions of national producers. The main research findings are the need of adaptation of basic NPD frameworks, strong influence of marketing analyses and planning quality and customer interaction on new products' market performance. Theoretical contribution is expressed in suggested NPD process model adapted for Russian industrial companies. From managerial viewpoint, research findings and developed practical recommendations can help Russian producers both from machine-tool and other B2B industries increase competitiveness and commercialization potential of their innovative products.

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1 INTRODUCTION

1.1 Research background and research gap

In today's economy characterized by high speed of technology development, globalization of markets, tough competition and increased customer requirements, development and successful commercialization of innovations became the main condition of a company's competitiveness and long-term market presence. Thus, success in commercialization of innovations is of strategic importance for companies.

At the same time the process of commercialization of innovation is characterized by high degree of risk due to market fluctuations and uncertainty in future conditions in decision-making process. These as well as many other negative factors most often become invincible obstacles for many talented innovative ideas. Statistics show that in most of the industries only one from 3000 new ideas is successfully commercialized (Stevens, Greg & Burley 1997) The study of McKinsey company conducted in 2010 revealed that only 39 percent of respondents say their companies are good at commercializing new products or services (McKinsey&Company 2010).

These negative features can be characteristics of a whole industries and even countries, especially those with transitional from administrative to market economy (Kleibrink, Larédo & Philipp 2017; Yarotskaya & Krivoruchko 2013). The thesis paper will consider Russian industrial market, which, in spite of difficult general economic and political conditions, is characterized by the following hindrances for innovative activity: lack of reliable and efficient connections between markets, researchers and enterprises; disinterest of potential users in innovation and underdeveloped private funding (Maeva&Zvonova 2011). Additionally, there exist company-driven obstacles such as widely accepted cost management system according to which innovations are assessed only as expenses during their development and commercialization; inability to correctly assess the commercial potential of an innovation and subsequent allocation of funds to unworthy projects; lack necessary managerial competences All these circumstances result in low efficiency of innovative activity, non-competitiveness and unattractiveness of new product for domestic and foreign users.

At the same time the abovementioned internal and to certain degree external obstacles can be reduced given the presence of quality marketing plan in the very beginning of an innovation development (Cooper 2012) However, many Russian companies are characterized by

incompetent and very often formal approach to marketing planning. Many small and medium-size businesses neglect strategic marketing planning since they consider it a feature of only large enterprises and limit themselves to tactical aims (Minin 2007, 28). This to much extent explains low rates of successfully launched national innovations. Consequently, existing models and frameworks for development and commercialization of innovative products should be adapted for national industrial enterprises taking into account specifics of their environment and the level of their general and innovation management skills.

Although there already were several researches of national scientists where the aspects of innovative marketing planning for national companies, relevance and efficiency of existing popular models in Russian economy were addressed (Kochurova 2016; Dubrovsky&Ivanova 2017; Budrin, Burubi & Buras 2015), they did not consider industrial markets separately and, what is more important, did not provide recommendations for Russian producers in the result of their studies. Thus, the study of marketing planning and the process of innovations development and commercialization in Russian industrial market, revealing of its features and problems and development of recommendations for innovative companies is aimed to fill the existing theoretical gap.

1.2 Research aim, questions and objectives

In correspondence with the abovestated, the main research aim is the analysis of new product development models and marketing planning for Russian industrial innovations and development of recommendations on their optimization on the example of national B2B producer.

Achieving of this aim implicates answering the specified below research questions:
1. What are the particular conditions of innovative activity in Russian industrial markets?
2. How do the most common existing frameworks of new product development (NPD) process correspond to these conditions? What is the optimal model for national B2B producers?
3. What drawbacks do Russian industrial companies have in their marketing planning and NPD process? How do they influence market performance of their new products?
4.What improvements can be made in the companies' marketing planning and NPD process in order to raise competitiveness of their innovations?

In correspondence with these questions the following research objectives were formulated:

- review of theoretical materials about types, features and development of industrial innovations;
- analysis of the contribution of marketing planning to the success of new products in the market;

- and its role in innovations commercializing;
- review and analysis of conditions of innovative activity in Russian industrial market
- assessment of existing models of innovative products development and efficiency of their application in Russian B2B market;
- conduct of empirical research of marketing planning in the process of innovations development in Russian industrial company and analysis of its results;
- development of recommendations for the investigated enterprise on optimization of marketing planning for innovative products.

1.3 Research scope and environment

The study is focused on marketing planning and analysis, the process of development and commercialization of innovations, it does not address other constituents of new products' success such as qualification of personnel, R&D quality, etc.

Secondly, as an example of Russian B2B industry, the research considers national machine-tool construction, that was chosen because of several reasons. Firstly, it has strategic significance for the country, since its products are necessary for other manufacturing industries, military and defense and transportation sectors. Unfortunately, in Russia it is characterized by significant backwardness from other countries that is conditioned by long-term and deep recession both in terms of production volumes and level of technological development (Machine-Tools Construction Portal 2013) caused by the change of national economic model in 1991. Its recovery had started only about eight years ago and has very low temps in spite of intensive state funding and support (Informational Portal of the RF 2017). Additionally, currently Russian machine-tools industry is characterized by very high level of imported products and low customer attractiveness of domestic machine-tools that is to much extent caused by national producers' lack of managerial competences for successful development and commercialization of innovative products (Dorofeeva 2011; Matkovskaya 2010). According to the state strategic plan, imports are intended to be decreased to 50% until 2030 (MINPROMTORG RF 2018, 55). That is why it is vitally important for national manufacturers to produce goods attractive for domestic customers and successfully commercialize them.

The given paper is intended to help Russian machine-tools producers to improve marketing strategy, increase competitiveness and chances for market success of their innovative products. in the recovery and following innovative development processes as well as provide support for successful competitive performance in domestic and foreign markets.

The research considers marketing planning and NPD process on the example of the OJSC “SASTA” (SASTA (a) 2018), national innovative machine-tool producer. Choice of this company is explained in Section 3.1 of the given paper. Although there may occur certain regarding representativeness of the research results, it should be noted that significant disadvantages marketing and innovations are inherent to majority of Russian industrial producers (International Information-Technology Portal “Equipment & Instrument” 2018), thus, with certain degree of adaptation the research conclusions can be generalized to many other companies.

1.4 Research strategy and organization of the study

Theoretical part of the thesis corresponds to the aforementioned research objectives. It starts with literature review that considers innovations and the process of their development, features of innovative activity in Russian machine-tool industry, marketing planning for innovative products. Further in the given Section is provided analysis of the most popular existing models of innovations development, on their appropriateness for particular industry’s conditions.

The next chapter considers empirical part of the study. Firstly, applied research methods and procedures are described, general information about the case company is provided, information obtained during empirical research is presented. Then, the analysis of this data is conducted on the basis of previous theoretical implications. In the last section practical recommendations for the case company on optimization of the NPD process and marketing planning are provided.

Schematically the given thesis framework is presented in Figure 1.

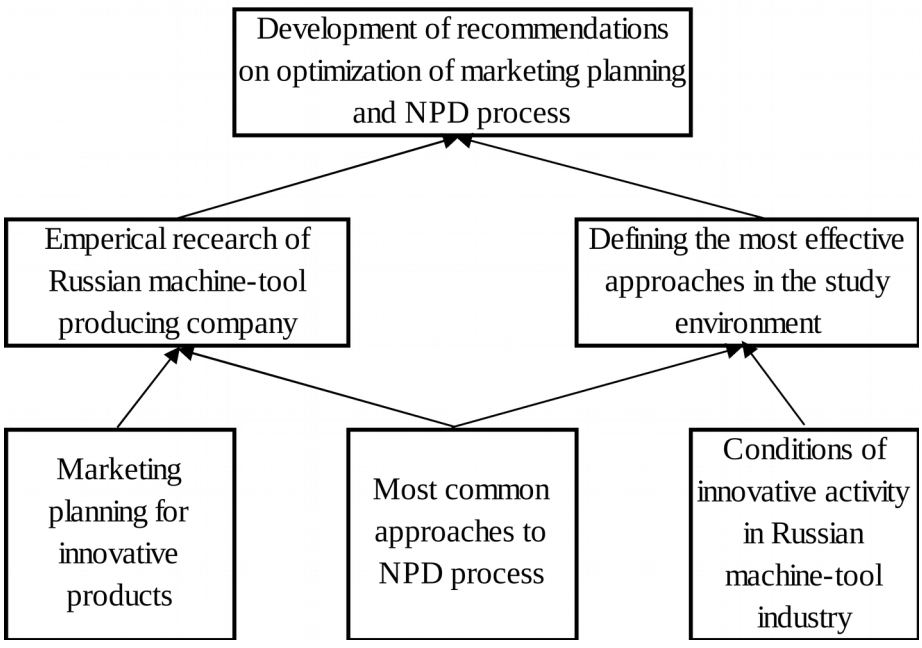


Figure 1. Thesis framework.

In the last chapter is presented discussion of the research results, its theoretical and managerial contribution. As well, research limitations and reliability are explained. Finally, suggestions for further studies in the field are provided.

2 LITERATURE REVIEW

2.1 Types, features and development of innovations

The greatest contribution to the development of the theory of innovation was made by Austrian economist Joseph Alois Schumpeter, who at the beginning of the twentieth century formulated five basic cases, corresponding, in his view, to the essence of innovations (McCraw 2007, 73):

1. The introduction of a new good – or a new quality of a good.
2. The introduction of a new method of production.
3. The opening of a new market.
4. The conquest of a new source of supply of raw-materials or half-manufactured goods.
5. The carrying out of a new organization.

These provisions are considered fundamental in the subsequent scientific research of innovation as an economic category. It should be noted that the term "innovation" despite its widespread use remains a very ambiguous concept.

Despite the different approaches to the definition of the essence of the term "innovation", the basic one now is the one introduced within the academic manual for innovative management – "The Oslo Guide" (2005, 9), which distinguishes between product and process innovations. Thus, a technological product innovation is the implementation/commercialization of a product with improved performance characteristics such as to deliver objectively new or improved services to the consumer. A technological process innovation is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these.

In the given paper innovations are considered as new ready for sale products and services, since it is concentrated on innovations commercialization aspect.

The variety of types of innovation necessitates their generalization and systematization, that is, certain classification. All variants of classification of innovations offered by scientists are different, first of all, by the number of classification characteristics. Most frequently innovations are distinguished by depth or by sphere of innovational changes.

Depth of innovation that means the strength of innovational changes. Different scientists define various types of innovations when classifying them by this criterion. C. Freeman, J. Clark & L. Soete (1982, 115-118) suggest the following ones:

Incremental innovations. They occur in all the industries, although with different frequencies. Most often they are results of not mainly R&D, but outcomes of inventions and improvements suggested by engineers and others directly engaged in the production process, or as a result of initiatives and proposals by users. Definitely this type of innovations is most common for B2B industries (Vovk & Braga 2017, 292).

They are particularly important in the follow-through period after a radical breakthrough innovation and frequently associated with the scaling up of plant and equipment and quality improvements to products and services for a variety of specific applications. Although separately no one of them brings dramatic changes and sometimes can even remain unnoticed, their combined effect is extremely important in the growth of productivity, which is reflected in input-output tables over time by major changes in the coefficients for the existing array of products and services.

Radical innovations. These are discontinuous events and in recent times is usually the result of a deliberate research and development activity in enterprises and/or in university and government laboratories. They are unevenly distributed over sectors and over time.

New technological systems. They include numerous radical and incremental innovations in both products and processes. Obvious examples are the 10 clusters of synthetic materials innovations and petrochemical innovations in the thirties, forties and fifties.

Changes of techno-economic paradigm (technological revolutions). These are far-reaching and pervasive changes in technology, affecting many (or even all) branches of the economy, as well as giving rise to entirely new sectors. Characteristic of this type of technical change is that it affects the input cost structure and the conditions of production and distribution for almost every branch of the economy.

All different types of innovations have two core characteristics:

a) Creation of something new or improved with features which had not existed before.
b) Creation of value (Notion of “newness” itself not enough for the definition of innovation. There are plenty cases where something new brings no value, for example, new color of product. Real innovations always bring certain value).

To date there exist several models of the NPD process, choice of which is usually subject to a certain company's s industry. At the same time, most widespread, classical approach is the Stage-Gate framework introduced by Robert Cooper in 1993. According to it NPD consists of the following stages (Cooper 1995):

- **Idea Generation.** Discovering and reveling business opportunities, development of ideas. Although this process was not initially included in the original Stage-Gate model, later Cooper reconsidered it and defined as "Stage 0". Some scholars also call it "Fuzzy Front-End" (Koen 2001, 46, 50-51), that means that it is usually difficult and confusing start of new product creation, and define several phases of it:
    - Opportunity Identification.
    - Opportunity Analysis.
    - Idea Genesis.
    - Idea Selection.
    - Idea and Technology Development.

Front-end activities are not so much expensive as time-consuming: they can take about 50% of total development time (Smith & Reinertsen 1998) yet, it is worthy, since definitely here the success of future new product is grounded.

- **Stage 1 – Scoping**. Mostly inexpensive, fast desk research for preliminary examination and the following scoping of the project.
- **Stage 2 – Build the Business Case**. Detailed investigation involving primary research (customer, market and technical), design of particular business case that includes product and project definition and justification, development plan.
- **Stage 3 – Development**. Elaboration of product design, product development, designing of production processes needed for full-scale production.
- **Stage 4 – Testing and Validation**. Tests or trials in the lab, plant and marketplace to verify and validate the proposed new product, brand/ marketing and production or operations plans.
- **Stage 5 – Launch**. Start of full-scale production and sell of new products. This stage is considered the most risky, since there new product becomes available to wide audience and its success already does nod depend on the company, rather on the users' perception. At the same time, for product innovations, it is inevitable and most importance because the second core function of innovations – providing value is fulfilled only under their presence in the market, e.g. commercialization.

Datta, Reed & Jessup (2013) define commercialization of innovations as a firm's capacity to bring a product into a market and reach the mainstream of the market beyond the initial adopters. Such definition is explained by the fact that often innovations become widespread only among limited number of people e.g. initial adopters while successful commercialization implicates transfer of a new product to mass. According to them (2013, 2), firm's ability to commercialize innovations can help dominate current markets or develop newer markets, which contributes to continued industry leadership. Under this ability the scientists implicated development of the product concept, its successful launch, and interaction with potential buyers. Rogers defined commercialization as “production, manufacturing, packaging, marketing, and distribution of a product that embodies an innovation” (Rogers, 2003, 143). At the same time he stated that commercialization is a stage of innovation development process, which “consists of all of the decisions, activities, and their impacts that occur from recognition of a need or problem, through research, development, and commercialization of an innovation, through diffusion and adoption of the innovation by users, to its consequences.” (Rogers, 2003, 135). Thus, researchers should consider commercialization potential early in the discovery process. Previously, only technology potential assessment was conducted, however, over time, there appeared a need to include the assessment of market potential in the framework of commercial potential estimating, since the commercialization process's outcomes directly depend on both on the quality of technology and its relevance in the market, (Pilnov 2006, 8). At the same time, the bias of excessive and narrow focus on only R&D and technology is very common for B2B producers. Given that B2B innovations development process tend to be longer and more difficult, it is very easy to see how R&D becomes its central part. As one B2B executive commented during an interview on innovation, “…the main challenge is to get them [scientists] to understand that it’s not all about the science; they need to understand the business drivers…” (Desai 2018).

Ponomarev (2012, 53) suggests the following commercialization potential assessment criteria (Figure 2):

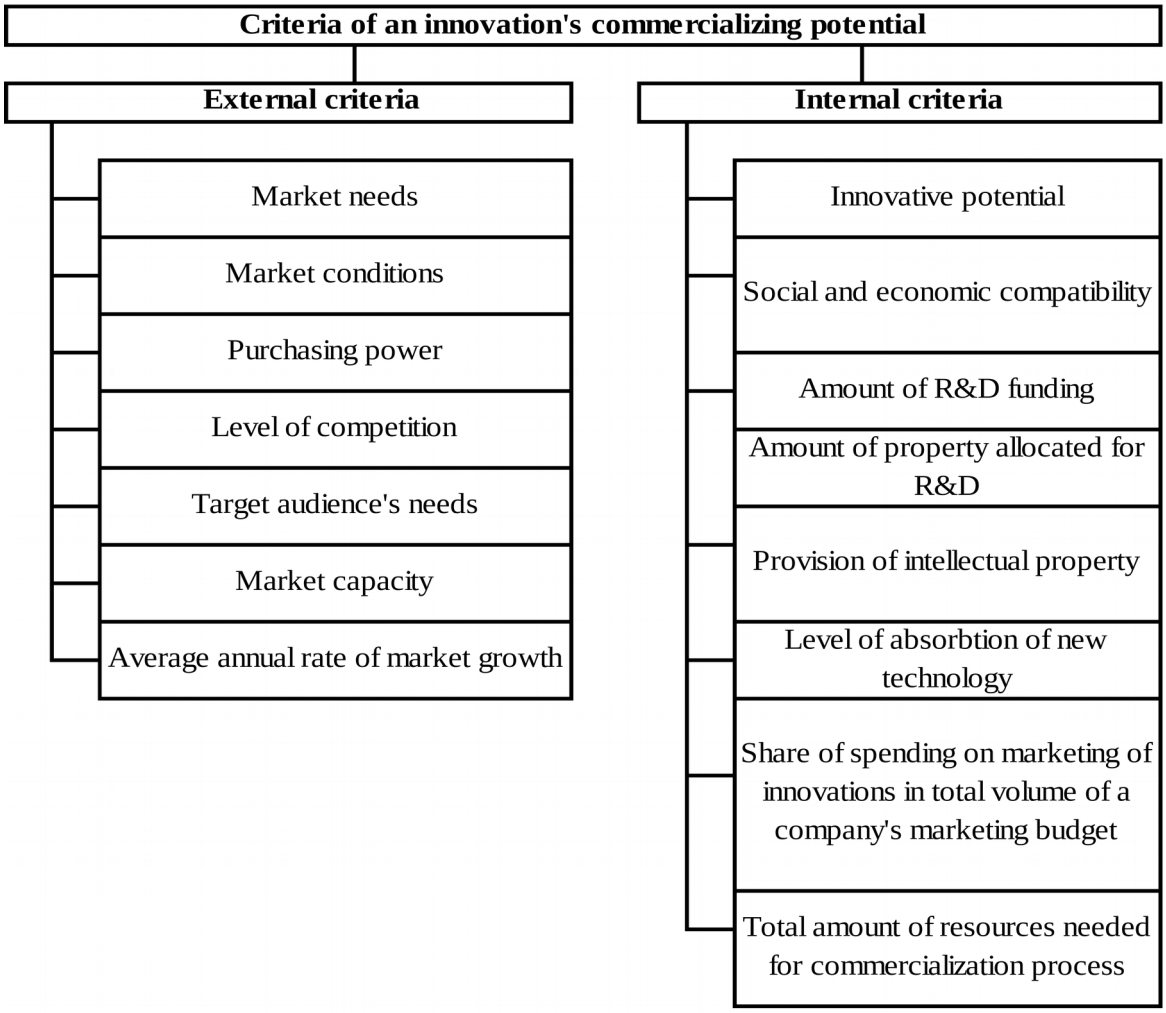


Figure 2. Criteria of an innovation's commercializing potential. *Source: adapted from Ponomarev 2012, 53-54.*

From the figure one can see that the indicators of all the external criteria, that help the researchers to form the insight of the future product's place in the market are obtained with the help of marketing analysis in the course of marketing planning for an innovation, that is more in detail considered in the next section.

To sum up, most of the industrial innovations belong to incremental type, their development is far more complex and extensive that that of B2C new products. Secondly, any novelty can be considered genuine innovation only if it brings certain value to producers and consumers that is realized only after their commercialization.

2.2 Marketing planning and its contribution to innovations' market performance

Given that nowadays activities of any enterprise in the market are based on the concept of marketing that is "to produce what is bought, not to sell what is produced" (Kotler & Keller 2012), the role of marketing planning for innovation enterprises is hard to be overestimated.

Appearance of innovations in the market, availability of them to the customers is subject to a company's marketing function. According to the American Marketing Association: "marketing is the activity, set of institutions, and processes for creating, communicating, delivering and exchanging offerings that have value for customers, clients, partners and society at large (Kotler & Keller, 2012, 27). Necessary commercialization activities and their sequence are defined during marketing planning process that is "a process of strategically analyzing environmental, competitive and business factors affecting business units and forecasting future trends in business areas of interest to the enterprise; participating in setting business objectives and formulating corporate and business unit strategy; selecting target market strategies for: the product-markets in each business unit; establishing marketing objectives; developing, implementing and managing program positioning strategies for meeting target market needs" (Fifield 2012).

The marketing planning process, as proposed by M. McDonald (2004, 62), is shown in Figure 3.

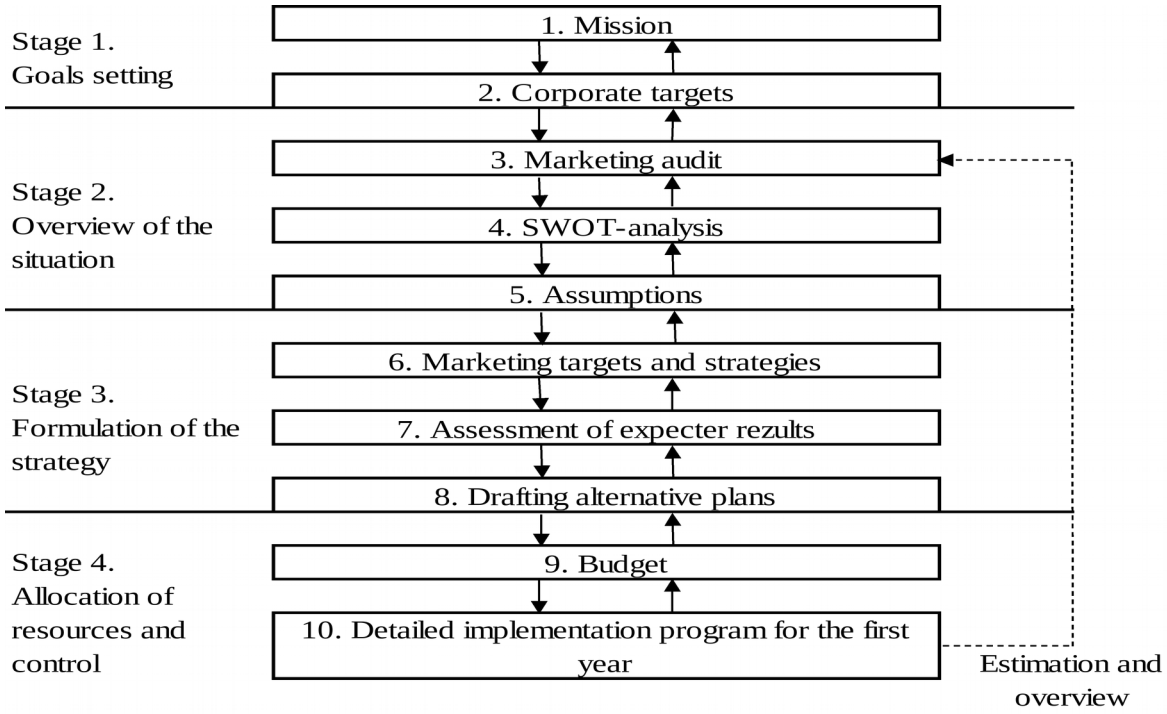


Figure 3. The process of marketing planning by M. McDonald. *Source: McDonald, M. (2004, 62).*

The results of this process is basic marketing strategy. It is not written in detail, as too often the detailed schedule of the strategic plan is toppled by unexpected of events in the external environment. Therefore, the basic marketing strategy (as the targets themselves) is not something given once and inappropriate. It should be updated and adjusted according to the changes occurring in the market at least once a year. This strategy contains fundamentals for tactical and operational plans which in their turn are created separately for each innovative product and solve more specific matters. Tactical tasks include accounting for demand fluctuations; organization of distribution; organization of advertising and sales promotion, in accordance with the product life cycle stage; definition of terms and principles of launching a new product in the market; accurate estimations of the amount of resources that can be used by the company, and the defining the terms of their receipt from different sources. Operational plans deal with implementation matters such as time, sequence, conditions, financial opportunities, performers, etc. Presence of such plans ensures clearness and cohesion of commercialization process, helps to avoid unexpected problems and inconsistencies.

Separately should be considered marketing of innovations that is still a rather new notion. The prerequisite for its appearance was the growing role of innovation in socio-economic development. Markova (2009, 276) states that marketing of innovations is necessary to ensure the effective exchange of innovative products in the market, which is achieved by adapting the novelty to the needs of consumers. Based on this, one can conclude that the goal of marketing of innovation is the successful introduction of a new product to the market. Barancheev (2007) suggests that the ultimate goal of marketing is not only to introduce innovations to the market, but also to ensure their competitiveness and future sales. This can be achieved through managing the life cycle of innovation. As well, both the Barancheev (2007) and R.G. Cooper (2001) emphasized that marketing planning for innovations begins from the earliest stages of new products development, in order to have clear understanding of how, to whom and where will be sold products that is under development and be able to reveal and mitigate risks that can unexpectedly arise during commercialization phase.

The first phase of the planning process is thorough market analysis prior even to the selection of ideas for new product. It is aimed at understanding of company’s external and internal environment state, on which largely depend the outcomes of the development process; consumer analysis is also vital: it helps to update company’s existing knowledge of intended target audience’s preferences and needs, thus, make the ideas search and selection processes aim-oriented. Additionally, at each of the following NPD process’s phases there should be performed

another relevant marketing analysis which help to reveal possible risks or shortages of the project and make timely corrections or adjustments.

Unfortunately, many companies neglect these analyses especially in the first half of the development process since they wrongly suppose that marketing related activities refer only to launch of innovations and that it should be started only being close to these stages.

Having investigated statistics of innovations failures, E. Nagorny (2013, 168) revealed that 30-40% of new industrial products are subject to failure. He conditioned it by a number of reasons both technical and marketing nature, as well as almost complete absence of marketing testing of innovative products conducted in the form of various marketing analysis during all the development process, not only prior to market launch as it is still done by many enterprises. The scholar developed methodological base for marketing testing of new products at each stage of the NPD process with the help of appropriate marketing analysis frameworks or “filters” (Table 1). He as well identified the tasks of these analyses at each of the stages. The author of the given paper supplemented this base with risks, which occur in case a company leaves these tasks unsolved also in regard to each stage (Column 4).

Table 1. Tasks and risks solved by marketing testing at different stages of innovation development cycle. *Source: based on Nagorny 2013, 169-171 and added by the author.*

New product development cycle stage	**Type of marketing testing**	**Main problems (tasks) that are solved**	**Risks of neglection of tasks**	**Testing instruments**
1	2	3	4	5
Analysis of the correspondence of internal development opportunities to external ones	Testing of directions and types of innovative activity	Checking whether the existing lines and activities of the enterprise meet modern conditions; analysis and evaluation of directions and options for market development that are opened before the enterprise	Choice of wrong innovational direction, failure, loss of considerable amount of financial and time resources	Portfolio methods; SWOT, PEST, SNV-analysis
Generation of ideas	Testing of sources of ideas	Identification of target consumers, their needs, evaluation and selection of optimal sources of ideas, as well as methods of generating ideas within the selected sources	False choice or characteristics of target audience, inability to satisfy its needs and compete with other	Marketing survey of customers; methods of innovative ideas generation

			producers; inappropriate source of ideas	
Selection of ideas	Testing of ideas	Determining the criteria for selecting ideas; critical evaluation and selection of optimal product ideas; testing the possibility of bringing the idea to the level of new technologies, designs, products, solutions; preliminary assessment of the market prospects of the idea; determining the level of novelty of the idea and consumer appeal, risk assessment	Choice and investments in inappropriate idea that does not meet target audience's need and preferences; impossibility of technological or technical realization of an idea; low degree of novelty; presence of analogues among competitors' products	Control questions; method of filtering criteria; rating ideas; method of the evaluation scale; marketing research of consumers
Development of product concept	Concept testing	Research of the product concept by target consumers, analysis, evaluation and selection of the optimal alternative product concept; assessment of market prospects of the concept and innovative potential of the developer of the concept, determination of the level of novelty of the concept, risk assessment	Inability to identify and terminate failure project at early stage; further investment in non-demanded product; low acceptance of ready new product among customers	Control questions; method of filtering criteria; rating ideas; method of the evaluation scale; marketing research of consumers; matrix of customer preferences
Development of marketing strategy	Testing of marketing strategy	Detailed analysis of the existing and potential needs of consumers, analysis of the market potential and the situation of its development, analysis and selection of the optimal marketing strategy; test of market attributes of products	Appealing to false or minor needs; incorrect elements of marketing mix	Methods of demand forecasting; market research of customers
Business-analysis	Testing of defined aims and existing possibilities	Analysis and evaluation of intellectual, scientific and technical, production, marketing opportunities and resource support for the implementation of innovations in the products	Incompatibility of resources to project aims; irrational organization of production	Economic methods (IRR, NPV); break-even analysis; functional and cost analysis; methods for

		being developed; estimation of economic efficiency of production and sales		demand forecasting
Product development	Testing of the product prototype and production process	Determining the attitude of consumers to the proposed prototypes; evaluation of the prototype quality in comparison with or competitors' goods; choice of the optimal prototype from several options; laboratory and consumer tests of prototypes; test production, analysis of options for technology patenting; technical preparation of production; assessment of the level of novelty, risk assessment	Dissatisfaction of customers by new product; presence of better analogues; low quality and breakages of new product at customers' facilities after sales; copying of invention by competitors	Tests in the laboratory; testing under operating conditions; portfolio methods; cost analysis
Market testing of new product	Trial marketing	Final market evaluation of developed innovative products and their marketing support: testing of prices, sales network, promotion activities, etc.; analysis of product positioning with respect to similar products of competitors and own portfolio	Shortages in marketing complex; vulnerability to competitors' strategies	Field and laboratory marketing research; computer modelling; consumer tests; testing products at the manufacturer's stands; market tests

Many other researches also testify great probability of failure for companies, which disdain marketing constituent in innovative activity.

Thus, Cooper (2000) concludes that about 75% of new products' market failures are mainly due to market factors. Although the scholar did not condition all them exactly by companies' marketing functions quality, it becomes understandable that the latter are worthy paying much attention of innovative enterprises.

In a more recent investigation of reasons for innovative products failures Simula (2012, 298-300) one more time testifies the importance of marketing planning during NDP process. He distinguishes six groups of issues which lead to breakdowns: marketing, timing, technical, financial, organizational and environmental. Each of these groups contains number of several concrete reasons for commercialization failure. It is notable that 17 out of 48 reasons that is about 35 per cent of failures occur exactly due to neglecting of marketing aspects, thus, they

could be prevented given sufficient attention to marketing strategy elaboration and further following marketing plan which reflects this strategy.

To conclude, it is apposite to site Philip Kotler, who wrote: “Technologies are invented in laboratories, products are created by marketers” (Yudin 2011). Thus, in order to be competitive and have sufficient demand for its products, a company should not only create innovations, but also pay much attention to development of marketing strategy for them. Planning of further sales and relevant analysis should be started already during selection of new product’s ideas and accompany all the development process; so, and only so it is possible to mitigate market risks and ensure further worthy performance of the product.

2.3 Features of innovative activity in Russian machine-tool industry

The development of a country's machine-tool building industry occurs within the framework of five stages with the following characteristics MINPROMTORG (2018):

I. Weak industry development:
- Full dependence on imported equipment;
- Minimal development of own production.

II. Origin of the industry:
- Import of high-tech equipment;
- Active transfer of imported technologies;
- Beginning of production of own products.

III. Ensuring technological independence:
- Aiming at full provision of needs with own resources;
- Development of own technologies (merging with world leaders / support of own R&D);
- Increase of export deliveries.

IV. Export-oriented development:
- Satisfaction of domestic needs (a small share of imports);
- The share of exports in production is more than 50%;
- Improvement of the technological level;
- Support for R&D.

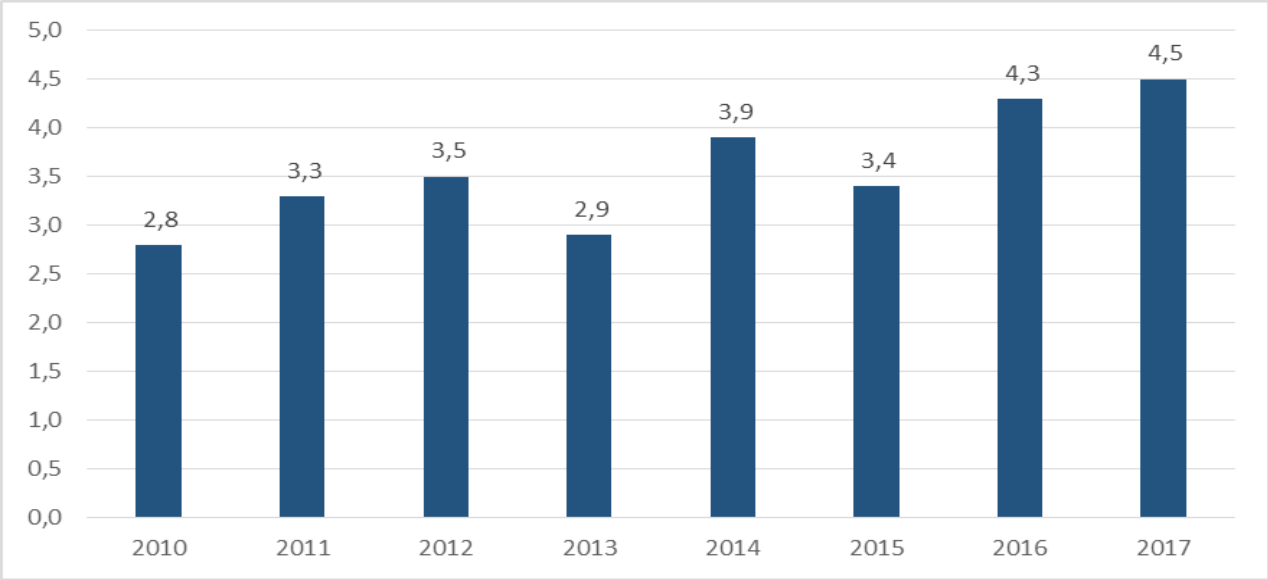
V. "Development decline":
- Loss of technological superiority;
- The decline in labor productivity;
- Increase in the share of imports.

Unfortunately, now machine-tool construction in Russia is characterized by the first stage of development, since its level of development is very low and the dependence from import

products is about 80-90%. Export possibilities are very limited due to low competitiveness of national products MINPROMTORG (2018).

After changing of the model of the economy from the state plan to market conditions, the machine tool industry turned out to be in the deepest crisis. Because of the general economic shock, the demand for machine tools among the main consumers - machine-building enterprises fell dramatically. According to rough estimates, during this time about 40 machine-building enterprises ceased to function - about a quarter of all Russian manufacturers. The survived organizations were in a deplorable state. Very slow recovery of national machine-tool industry began only in 2007 when the state paid its attention to the industry's conditions (Bulanov, 2017). Still, the consequences of the recession are not finally overcome and in some cases the situation can get even worse with time. For example, the number of unprofitable enterprises producing machines and equipment increased from 434 in 2010 to 496 in 2015, and the amount of their losses increased from 670.8 thousand USD – in 2010 to 716.7 thousand USD – in 2015 (ROSSTAT 2016, p. 234). At the same time, according to the data of the Ministry of Industry and Trade of the Russian Federation, from the 12 city-forming enterprises of machine-tool construction and investment engineering two enterprises are in a state of crisis (as of August 2017) (Accounts Chamber of the Russian Federation 2017).

Although in 2017 relative to 2010 production of machine-tools increased 1.6 times (Picture 4), but it still remains catastrophically small amount compared even to the "stagnant" eighties of the last century. In 1980, in the RSFSR were produced 97.5 thousand units of machine tools, which is 21.7 times more than in 2015 (KM.RU 2018).

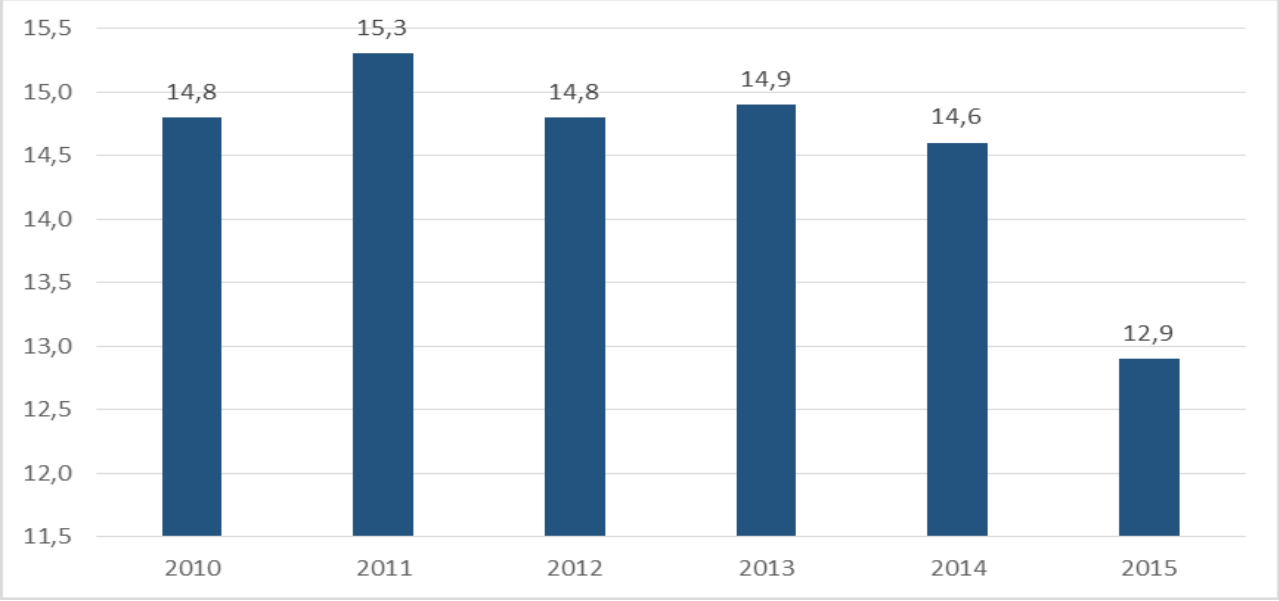


Picture 4. Production of cutting machine tools in Russia, th. units. *Source: Composed on the basis of Accounts Chamber of the Russian Federation (2017).*

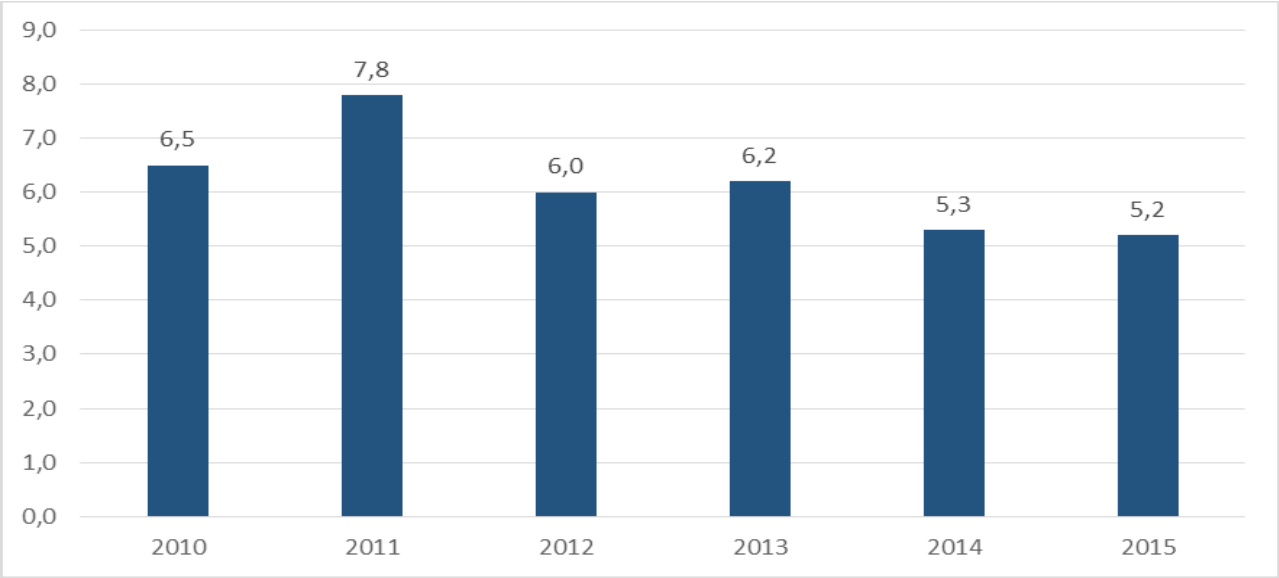
An unfavorable picture is formed in relation to fixed assets of manufacturing industries. Here it is necessary to say that official statistics does not conduct separate observation of the machine tool industry. This branch is included in the subsection "Machines and Equipment" in the section "Manufacturing". Of course, this to some extent reduces the accuracy of statistical data regarding machine tool construction, nevertheless, it allows to trace the development trends of this industry and does not distort the further logic of reasoning.

The degree of depreciation of fixed assets of manufacturing industries in 2016 increased by 3.9 percentage points compared to 2010 and reached 50%, the share of machinery and equipment there decreased from 55.3% in 2010 to 52.9% in 2016 (ROSSTAT 2017, 280 - 281).

There is a decrease in the innovation activity of enterprises producing machines and equipment (Picture 5, Picture 6). At the same time, the volume of shipped innovative goods, works and services newly introduced or subjected to significant technological changes in 2015 became less than this indicator of 2010 almost 1.3 times (Accounts Chamber of the Russian Federation 2017, 294).



Picture 5. The share of organizations (production of machinery and equipment), carrying out technological innovations in the total number of surveyed organizations (%). *Source: Accounts Chamber of the Russian Federation (2017, 290).*



Picture 6. The share of innovative goods, works, services in the total volume of shipped goods, works and services (production of machines and equipment), %. *Source: Accounts Chamber of the Russian Federation (2017, 291).*

Generally, industrial enterprises produce less innovative products than those operating in consumer markets. However, in Russia their rate is pathologically low – only 5-6% of industrial enterprises carry out the development and implementation of technological innovations (Maeva & Zvonova 2018) and only 6-7% of them can be represented on the international market among innovators capable of independently producing technological innovations that are in demand not only in Russia, but throughout the world. The main direction of innovation activity (more than 34%) of Russian enterprises is passive innovative borrowing, which does not correspond to the level of innovative participation demonstrated by world innovation leaders (Gurunyan 2015).

Among the factors hampering technological innovations in manufacturing industries there exist *economic, internal and other ones* (Table 2), their rating is shown in Figure 7.

Table 2. Factors hampering technological changes in manufacturing companies. *Source: Composed by the author on the basis of Gokhberg & Ditkovsky 2017, 49.*

FACTORS		
Economic	**Internal**	**Other**
1 – lack of own financial means	6 – low innovational potential of an organization	11 – insufficiency of legislative and normative legal documents for regulation and stimulation of innovative activities

2 – lack of financial support from the state	7 – lack of qualified personnel	12 – low development of innovation infrastructure
3 – low demand for innovative products and services	8 – lack of information about new technologies	13 – uncertainty in economic benefit from the use of intellectual property
4 – high costs of innovations and novelties	9 – lack of market information	-
5 – high economic risk	10 – low development of cooperation relationships	-

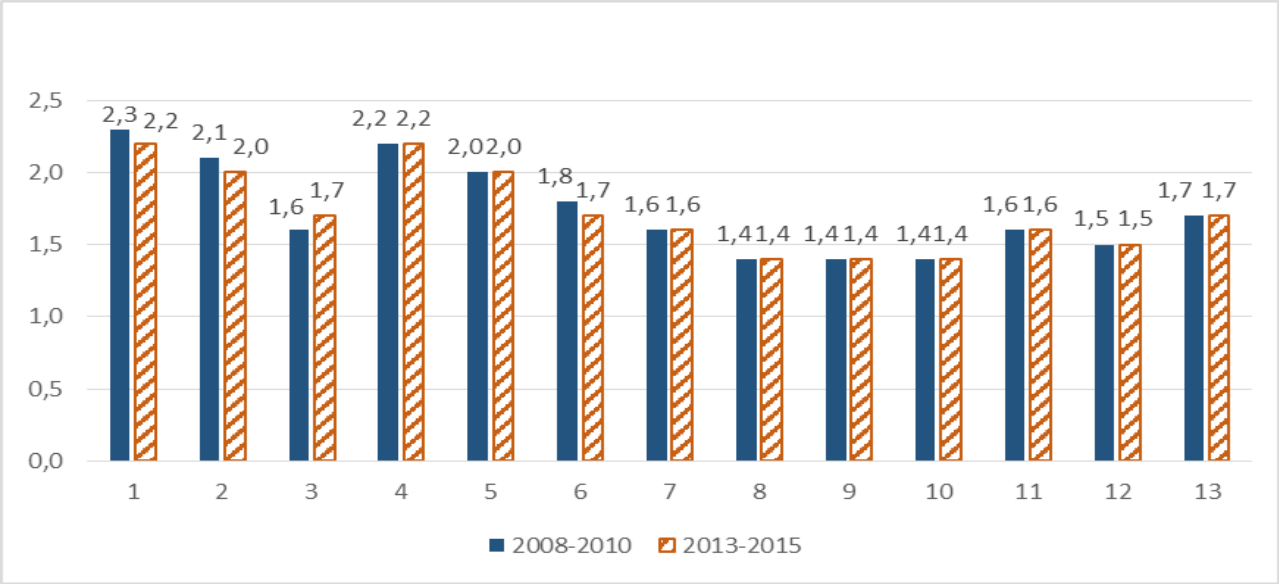


Figure 7. Rating of factors hampering technological changes in manufacturing companies.

Source: Prepared by the author on the basis of Gokhberg & Ditkovsky 2017, 49.

In spite of the aspects preventing development of innovations, many Russian companies, almost in all the industries, face not lesser difficulties with commercialization of their inventions. The problem is so acute that already got significant attention of state authorities: creation of a system of state support for the commercialization of the results of intellectual activity is now one of the priorities of the state policy in the field of innovation development (Government of the RF 2017) The attention of the state to the processes of commercialization of innovations is not accidental, since at present entrepreneurs are practically immune to innovations:

- investments are not directed to R&D;
- innovative products are not attractive to enterprises;

- innovative technologies are poorly implemented.

According to experts' estimates, in the last 20 years in Russia only about 10% of all scientific developments have been commercialized. The gap between the advanced countries in this sphere is estimated at about 40-50 years. The implementation of innovative projects in developed countries provides 50-85% of GDP growth. In Russia, the trend is reversed: the production of innovative products is 0.3-0.4% of the global volume, and the share of innovative industries and services in Russia equals only 5.5% of the GDP (Dorofeeva 2011, 61).

Due to the sluggishness of the processes of commercialization, especially from the business side, the trend generates a negative picture of low efficiency of the domestic economy. Meanwhile, commercialization is the form of the practice of creating and consuming innovative technologies, and from a number of such separate "commercialization practices" appears the dynamics of innovative activity in the state. In other words, the current national innovation system (NIS) is formed not only with the help of special measures of the state for creation of a regulatory and legal framework, incentives for innovative activity and development of special infrastructure, but also from commercialization processes implemented by individual entities. (Matkovskaya 2010, 36). One reason for such a state is weak development of the commercial innovation sector, that is, the supply of innovative technologies, thus, one can reasonably believe that another part of the problem is on the demand side. This is caused by low actual interest of the real sector in innovative technologies, rather than the lack of innovation or the weakness of intellectual potential. This is due to monopolization and low competition to some extent characteristic of virtually all sectors of the Russian economy. In Russia, as before, during the creation of innovations is kept orientation toward the development of science and technology without taking into account real demand.

Another significant problem is the lack of a link between scientists and companies. The given problem is caused by difference of perception of the purposes of innovations at the researchers' and the representatives' of business point of views. Scientists concentrate more on the development, the process of obtaining a product of innovation activity, not on making calculations. Investors are willing to invest only in financially sound projects, which have the effect of introducing the market. In this regard, in the market exists such a situation that innovations appear, but only very few of them reach end users.

Although many people explain backwardness of Russian Innovation System by insufficient funding for science, the problem is that there is no mechanism when this money starts to work in the economy and on the economy. Unfortunately, Russia has not yet created a mechanism for the

formation and implementation of innovation and investment cycles from the birth of an idea (scientific theory or hypothesis), including the conduct of experimental research and the creation of experimental design samples, to the final stage of organizing the production of high technology products and the introduction of high technology in production (Gribov & Kamchatnikov 2012). Thus, as it was drawn by Vasily Osmakov, Deputy Minister of Industry and Trade of the Russian Federation, about the potential of Russian machine-tool industry: "Russia has all the necessary competences for the production of both simple machines and complex five-axis machining centers with numerical program control..., but it is necessary to share technological competencies and the ability to sell" (MINPROMTORG 2016). Consequently, the enterprises should develop commercialization competences and seek to partly overcome these obstacles within their own powers. This task is just designed to be solved by marketing planning of innovations.

Despite serious difficulties mentioned above, it is necessary to say, that Russian machine-tool construction still did not come down from the arena of world competition and is making attempts to work in different innovative directions.

During the period from 2011 to 2017, 11 new metal-cutting machine tools were opened in the country, including those with foreign participation (Soloviev 2013). Development of centers for complex metal processing, the core of which is laser technology, making it possible to produce integrated processing of the material in a rather wide range, became popular among small machine-building enterprises. This enables large machine builders to outsource a number of non-core technological operations and reduce costs. Leading machine-tool plants in their turn are implementing advanced developments, applying the modular principle, production cooperation, automated design, updating their product lines, which are in high demand among consumers.

Russian government beginning from 2007 actively takes various measures for stimulation of recovery and innovative development of the industry, some of which are listed below.

In 2008, based on the profile university "Stankin", the State Engineering Center was established, tasks of which included conducting research and development to overcome technological backlog along with information and analytical assistance to private entrepreneurs interested in updating production capacities and other intellectual processes (Bulanov 2017).

In 2013 there was created OJSC “Stankoprom” holding, the system integrator of Russian machine-tool industry (Rostech 2018). The company, investigated in the given paper, OJSC "SASTA" is also its member. OJSC “Stankoprom” is aimed at uniting and modernizing the machine tool industry in Russia, as well as using the best world practices for the development of

Russian machine-tool construction. One of the key tasks of “Stankoprom” is a qualitative change in approaches to the technological re-equipment of Russian enterprises: from local replacement of equipment to complex technological re-equipment. In the coming years, the Holding is expected to significantly expand its structure through joint projects with Russian and foreign partners.

In addition, in June 2017 approved the Government of Russia approved the Strategy of the machine-tool industry development for the period up to 2030 and its implementation plan for 2017-2020. These documents formulate proposals for building new principles for the industry, as well as additional tools for supporting innovative activities (Garant 2018).

In particular, its main three aims are (MINPROMTORG 2018):

1. Increase in the share of Russian products in the domestic market to 50% by 2030.
2. Ensuring the growth of Russian production at an average rate of at least 15% per year.
3. Organization of competitive production of key components and tools.

At the same time, the government admits that currently preconditions for favorable industry development such as increase in domestic demand, talent pool and cheap national currency attractive for investors are currently absent (MINPROMTORG 2018). Thus, although innovative machine-tool manufacturers can from one side account for state support, from the other side, it will take certain amount of time. In this situation national companies should not passively until state supporting programs work at full scale, since there is a high risk for them to be superseded from the market by foreign importers. Within their powers they can undertake actions in order to increase competitiveness, mitigate risks and, thus, raise market chances of their innovations.

2.4 Assessment of efficiency of application of existing new product development models in Russian machine-tool industry

At the present stage of innovations management development there is no universal method that could be applied to any innovation's development process. The choice of optimal model always depends on each project's requirements, standards, resources, and procedures, company's external and internal environment, etc. Generally, there are defined two basic approaches to the NPD - Waterfall (cascade) and Agile (flexible). Recent novelty in the sphere of innovation project management became the introduction of hybrid Agile-Stage-Gate model. Below is presented description and analysis of these approaches on the efficiency of their application in the conditions of Russian machine-tool industry.

Stage-Gate

One of the most famous and popular models of new product development (NPD) is Cooper's Stage-Gate model suggested in 1993 (Cooper 2001), the stages of which were described in Section 2.1 of the given paper. This model became highly appreciated in business as a standard for managing innovation excellence (Edjett 2018, 1) because it provides clear and organized innovation development process and prevents businesses from spending time and money on unpromising projects. Below on Figure 8 is provided graphical representation of the NPD process as according to the Stage-Gate.

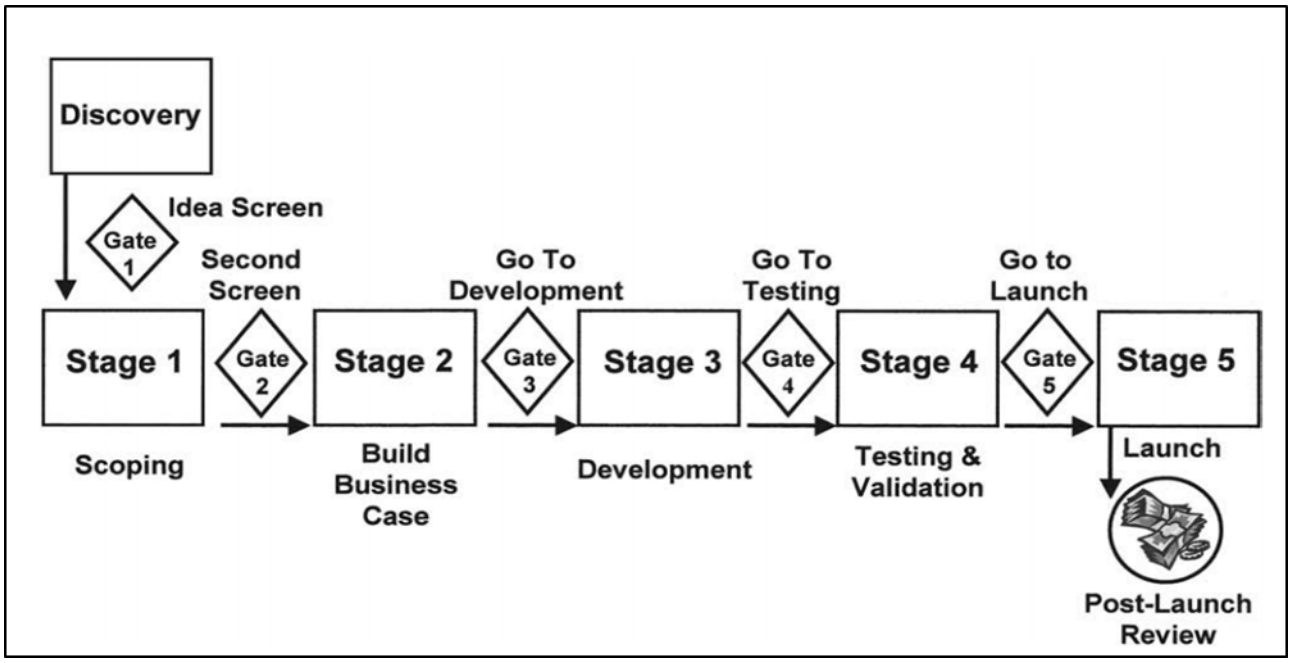


Figure 8. The Stage-Gate system model. *Source: Cooper, R.G. (2009).*

Stage-Gate is widely applied among leading companies all over the world: roughly 75 percent of major companies in Europe and USA use the model for development of their new products (Vedsmand, Kielgast & Cooper 2018).

Additionally, this model is considered the most appropriate for machine-tool construction, since its systematic waterfall approach is very convenient for development of incremental innovations, which are the most frequent in the sphere of industrial equipment production (Shemetev 2018).

The peculiarity of the model is that each stage is preceded by a decision point or gate, where unsuccessful projects are frozen, and resources are allocated to the best projects. When approaching the gate, quality of performance, commercial justification and quality of the work plan are assessed.

The structure of each gate is characterized by:

1. Reporting materials serving as input, that are provided by the project manager and his team for consideration. They are prepared in advance and represent the results of activities carried out during the previous stage. For each gate a standard set of reporting materials is specified.
2. Assessment criteria. They determine how the project is evaluated and how unsuccessful projects are eliminated. These criteria are usually organized into a single list and include both quantitative and qualitative indicators.
3. Output data, including the decision (continue, freeze, suspend the project or start the project anew) and further actions (approved work plan, date and reporting materials for the next gate).

The obvious advantages of the SG-model are (Dubrovsky & Ivanova 2017):

1. Minimization of risk by taking decisions on the continuation of the project after each stage. This approach leads to the elimination of low-income projects in the early stages;
2. Completion of each stage by checking compliance of the process with certain criteria, pre-specified results;
3. Transparency of the process. Each of the participants can see the correspondence of the results of the stage to key indicators;
4. Application of appropriate tools at each stage in the complex;
5. Management of the investment portfolio for all innovative processes, through the use of net discounted income, internal rate of return, labor productivity and other indicators;
6. Adaptation and scalability of the process, taking into account such factors as organizational and legal form, company size, type of innovation.

At the same time the Stage-Gate model has several limitations (Shemetev 2017; Hague, Hague & Harrison 2018):

- the Stage-Gate approach is basically sequential (waterfall). Some experts in the field of innovation are convinced that the development of the product should, in fact, be organized in parallel or spiral form and suggest such methodologies as Scrum or Agile that are briefly considered below. However, this also depends from the industry;
- lack of opportunity to return to previous stages;
- previous departments no longer have the opportunity to improve their stage of work after transferring it to the next group of specialists, subsequent specialists cannot bring their ideas when the project is in the previous stages;
- with each stage there is an increase in the cost of correction of previous defects;
- if the subsequent unit expresses important remarks to the previous stages and the management approves these remarks, the whole process starts anew from the first link of the chain;
- there is a contradiction between organization and creativity that are both very important in the framework of innovation. Some companies become too concentrated on a detailed

description of the model and excessive regulation. A certain amount of freedom must be inherent in the model;

- usually in the frames of the model customer interaction takes place only at edge stages, e.g. Scoping and Launch. It is possibly sufficient for B2C markets, however, in B2B environment customer interaction is very important, because industrial products are usually characterized by high degree of complexity, while the number of customers is much less than in B2C markets. Thus, it is vital that the developed products fully corresponded to target audience's preferences and needs. More frequent customer involvement during development process helps to find out their suggestions and ideas and embody them into new product.

Considering pure Scrum and Agile development methodologies, one can conclude that they hardly can be applied for creation of innovative products in machine-tool industry, since they initially were suggested for software development and have certain features, considered below, which completely do not correspond to creation of machine-tools.

Agile is flexible conceptual development methodology. It was suggested in 2001 by a group of software developers and is aimed at achieving significant results in the shortest possible time and reducing the costs associated with the production of unnecessary artifacts, as well as ensuring work in changing requirements (Agile Alliance (a) 2018). The method of implementing Agile projects is based on iterations. The whole NPD process is divided into several cycles (iterations) with a length of 1-4 weeks. Each iteration is considered as a separate microproject, in which there is a preparatory, planning, development and testing stages, at which the compatibility of the product with the requirements of the customer is checked. The result of each iteration is a version of final product with a specific set of technical characteristics that can be shown to the customer for making adjustments, if necessary. Schematically the model is presented on Figure 9.

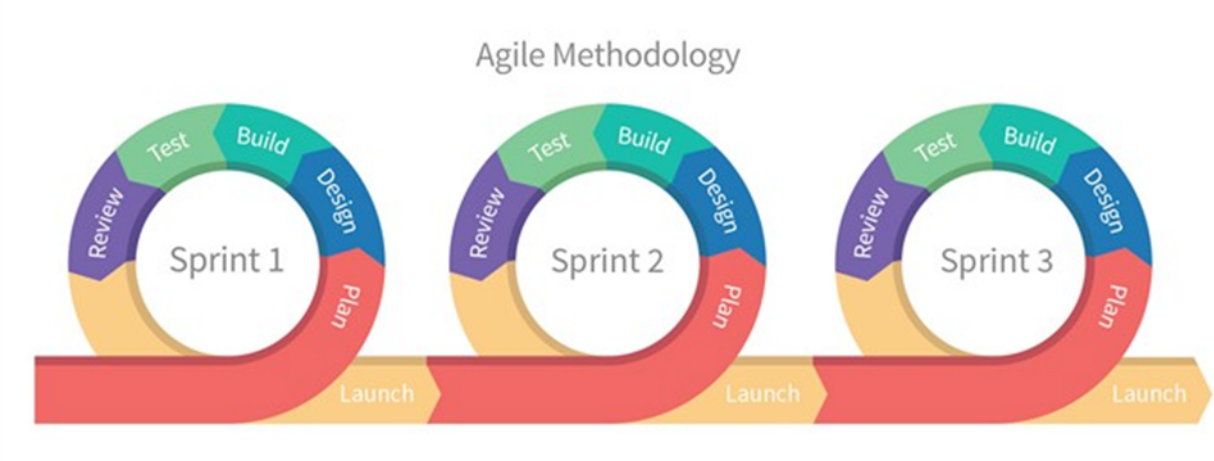


Figure 9. Agile methodology. *Source: Forschew 2018.*

Agile is based on the following principles (Agile Alliance (b) 2018):

1. Individuals and interactions over processes and tools;
2. Working software over comprehensive documentation;
3. Customer collaboration over contract negotiation;
4. Responding to change over following a plan.

Scrum is one of the more popular versions of Agile, it was developed in 1986 as "a framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value" (Schwaber & Sutherland 2013) as opposed to a traditional, sequential approach Scrum is a more rigid approach and was intended for rapidly changing environments. While Agile methodology advocates simplicity, Scrum promotes innovation and experimenting. There are also some organizational differences between two methodologies, however, development process has certain characteristics, which are common for both the Agile and Scrum.

In the Table 3 below are considered basic features of Agile or Scrum based development process and their applicability in the conditions of machine-tool construction industry.

Table 3. Basic features of Agile/Scrum-based NPD process and their applicability in machine tool Industry. *Source: Composed on the basis of (Sharma, Sarkar & Gupta 2012; Takeuchi & Nonaka 1986).*

Feature	Applicability in machine-tool industry
Development projects are usually done by customer order	This takes place only with customized equipment, when individual project is prepared; most of the machine-tools are intended for several customers, thus, development projects consider only common needs and preferences of the target group
In the beginning there are no clear project specifications, requirements evolve during the	This feature contradicts to development of industrial equipment, since product concept and its core technical characteristics should be ready before the start of

process	development, it is possible only to make insignificant modifications during the development process
User stories about their current practice (problem with existing product) are used for new product concept and design (product backlog)	This is fully applicable and very useful feature. Analysis of user experience helps to reveal their latent need and wants, shortages of existing products, that results in development of products with maximum customer value and satisfaction
Development process is divided into short iterations or sprints (usually 1-4 weeks); before each iteration there is a planning meeting. Prepared iteration plan looks like a project in miniature and includes all the tasks necessary for producing a mini-increase in functionality: planning, requirements analysis, design, task allocation, testing indicators and documentation to be prepared for further reporting	This may help to make complicated development process more ordered and clear for team members. Division of long sequence of activities into small iterations provides for clearness of tasks and reporting of stage's results, helps to avoid wasting time and resources that often in the case of long projects
Time and resources for each iteration are not flexible, only the amount of team's tasks can be changed	For industrial development process it is better to keep the balance between time/resource adjustments or reduction of tasks depending on particular case because usually no of them may be omitted or only some can be transferred to the next iteration
In each of the iterations is performed by cross-functional team, which includes employees from R&D, marketing, service, financial, logistics departments, etc. Employees with different skillsets complement each other for optimization of NPD process, risk management and maximizing of customer value	This feature worth implementation among Russian machine-tool producers. Although for many leading Western manufacturers such teams are already a common practice, in most of Russian companies cooperation between departments still leaves much space for improvement. There is lack of coordination and frequent conflicts of interests, that hampers development process
Long-lasting active customer involvement at each of the stages and intensive management support	Customer involvement is a plus, but only in cases where it really adds certain value to a stage (consideration of additional technical features, etc.). It is not necessary to interact with customers at each stage, since clear project specifications are already defined in the beginning. Management support should be a mandatory element for innovations development, especially in Russian machine-tool industry, where corporate governance is often characterized by high degree of bureaucracy and management is reluctant to changes and novelties
When each iteration is over, results (product or its part) is tested for functionality and presented to stakeholders	In development of industrial products there is no need to demonstrate results of each stage, since results of several stages may refer to internal technical features of the product and be unclear or unnoticeable to clients. Secondly,

(management and customers)	customers of almost all Russian machine-tools producers are located very remotely. Thus, such frequent presentations would be expensive, time-consuming and difficult to organize. Customers should be involved directly only on really important occasions. Referring to management, the results of each iteration should be shown only to direct management of the developed project; higher (corporate or business unit) management should be addressed when considerable project milestones had been achieved

Agile-based development methodologies in their own accord have the following drawbacks (Fridman 2016):

1) Unstable project scope: For some software deliverables, developers cannot quantify the full extent of required efforts. They neglect the creation of a development road map, as well as the management of requirements, during which such map is formed. A flexible approach to requirements management does not imply far-reaching plans (in fact, requirements management simply does not exist in this methodology) but implies the possibility of the customer suddenly set new requirements, often contrary to the design of already created product at the end of each iteration. This leads to disastrous overloads with massive refactoring and alterations at almost every next iteration;

2) More time and commitment: Close collaboration requires almost constant availability from all the parties, that is impossible to achieve in conditions of Russian machine-tool producers, because most of their customers are located in different remote cities in all parts of the country;

3) Quality issues: Agile implicated accomplishing the tasks given minimum time and resources that often negatively influences fulfillment quality;

4) Project easily falls off track: assuming minimum of planning in the beginning, there is high risk for developers to focus on wrong areas, since often initial clients' requirements are vague. Another risk is the potential for scope creep, and an ever-changing product becomes an ever-lasting one.

Although Agile methodologies are becoming more and more popular in other industries than IT, its application among manufacturing companies is very low (about 3-4%) (VersionOne 2018). Moreover, solid and proven Agile framework for manufactured products does not exist yet (Vedsmand et al. 2018). In case of machine-tool industry Agile or Scrum development methodologies can be used only in a very modified way, however, it is more rational to take only

several most appropriate features and use them for improvement of another development framework, for example, Stage-gate, since many years of experience of its application showed the need to adapt the management process to rapidly changing conditions and accelerate the innovation processes (Cooper 2016).

Already in 1995 R.G. Cooper formulated the properties of models of innovative processes of the next generation (Cooper 1995):

- Flow – the ability to overlap the stages of the innovation process with each other to increase the speed of innovation;
- Fuzzy gates – deciding on the transition of the project to the next stage can be very conditional;
- Focus on the leading, most promising projects;
- Flexibility - the variability of the number of stages of the process, depending on the scale, level of risk and financing of the process.

In this regard, T. Vedsmand et al. (2018) suggested hybrid Agile-Stage-Gate Model. It combines the advantages of a structured close model for managing product innovation and brings the benefits of Agile project management models, such as flexibility, cyclicity and speed. Graphically the model is presented in Figure 10.

Characteristics of the integrated A-S-G model application at the enterprise are:

- Minimization of the period of the innovation process as a whole due to a clear definition of the time of each stage of the innovation process. The stage time cannot be increased or decreased, but it is possible to change the number of stages;
- Variation in the number of stages of the innovation process, depending on the complexity of development and amount of funding;
- Coordination of the development process between the departments of the enterprise at each stage;
- Interaction with customers and users at all stages of the innovation process.

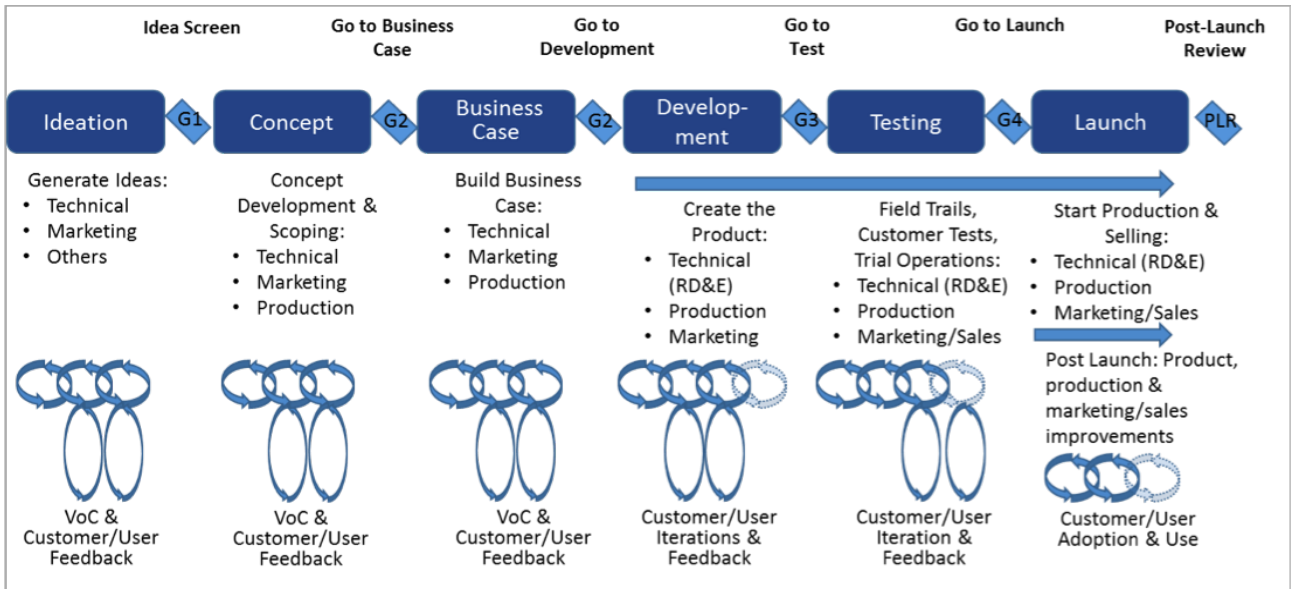


Figure 10. The integrated Agile-Stage-Gate model. *Source: Vedsmand et al. 2018.*

The model makes it possible to bring to the innovation activity such features of an open innovation process as organizational openness with the acquisition of knowledge from outside, as well as interaction with customers begins literally from the first stage of the research (Konstantinova & Boyko 2018).

Although the influence of Agile-Stage-Gate on success rates and development time is still not yet fully documented, and may vary across industries and types of organizations, in the study of five Danish manufacturing firms, there was revealed significant improvements of a number of performance metrics: faster response to changing product requirements, improved team communication, reduction of new products time-to-market (Cooper & Sommer 2016).

However, the hybrid of Agile and Stage-Gate models in that form as it is described above does not fully suit to Russian machine-tool producers, because their innovative activity has several peculiarities:

- Rigid systems of corporate administration and standardization conditioned by legal duties and limitations (Akmaeva, Epifanova & Zhukov 2017);
- Creation of new product in terms of state contract;
- Absence tried-and-true mechanisms of customer collaboration, underdeveloped communication channels;
- Application of Agile-Stage-Gate model requires high level of managerial skills and corporate culture, which, unfortunately, at the moment cannot be considered formed in Russia, it only begins to develop and it is necessary to take into account its features. The main problem is that most Russian companies simply ignore it. Numerous studies in this field show that only 20% of firms intentionally introduce elements of corporate culture.

Most often, it is either absent in firms or develops by itself informally (KDPC Consulting 2010).

Thus, as it was concluded by (Dubrovsky & Ivanova 2017) the main area of application of the A-S-G model at Russian industrial enterprises is the software development area, both for external customers and within the company. However, foreign experience shows that the hybrid model can be used not only for software development, the task of enterprise managers to adapt it for specific production.

Summary of three basic approaches' analysis is presented in Table 4 below.

Table 4. Advantages and shortages of basic NPD approaches for Russian machine tool producers.

Approach to the NPD	Advantages	Shortages
Stage-Gate (waterfall)	• Transparency and orderliness of the development process. • Customary waterfall structure.	• Impossibility to return to previous stages. • Customer involvement is implicated only on at edge stages. • Excessive amount of control points (gates). • Extended time-to-market. • More applicable for several projects.
Agile/Scrum (flexible)	• Strong consumer orientation. • Minimization of development time. • Absence of bureaucracy. • Multidimensional collaboration.	• Unstable project scope. • Absence of clear specifications and documentation. • Need for flexible managerial style. • Need for prior customer order and constant involvement. • Quality issues.

Agile-Stage-Gate (hybrid)	• Customary waterfall structure. • Strong consumer orientation. • Multidimensional collaboration. • Decreased duration of the NPD process.	• Rigid and pre-defined duration of each stage. • Need for flexible managerial style and mature corporate culture. • Need for customer involvement and feedback at each stage. • Impossibility to return to previous stages.

Thus, one can conclude that hybrid Agile-Stage-Gate model would be the most effective for Russian machine-tool producers as it unites the advantages of flexible and waterfall approaches, however, taking into account rigid administrative approaches and passiveness inherent to national B2B consumers, it is impossible to realize implicated levels of flexibility and customer involvement. Thus, in the author's opinion, optimal and accomplishable model for national industrial producers can be described as waterfall with elements of Agile that implicates keeping of advantages of both the approaches and eliminating revealed inconveniencies. The suggested framework should have the following features:

- Direct customer involvement can be omitted at "Building the business case" and "Development" stages (only if there is no such particular need) (see Figure 10). Usually, at these stages customer requirements and specifications are already clear, and, at the same time there is yet nothing to present to the users for feedback and testing. Taking into account the difficulties of customer interactions organization for Russian industrial producers, it is suggested to skip customer involvement at these non-crucial phases.
- Duration of each stage is rather planned than fixed in advance. The author reasonably supposes that often the often project teams will not be able to meet stated deadlines because of high amount of administrative and bureaucratic issues that often influence duration of the development process in Russia (Repin 2014). It will result in a number of artificially created stages (as supposed in Agile-based and hybrid models), that will generate new rounds of bureaucracy, costs and confusion.
- Possibility to return to previous stages. This feature eliminates one of the main shortages of Stage-Gate framework – irreversibility of the development process. Possibility to timely revise and correct previous phases' results allows saving much resources, while legitimacy and prevalence of such a procedure makes allows employees not to conceal later realized mistakes from the project management being afraid of punishment.
- Decrease in the number of gates. In the authors opinion, there should be left only 2 first gates after the "Ideation" and "Concept" stages (see Figure 10), because the rest of them

seem unreasonable. National enterprises do not possess big amount of innovative ideas and, as well, usually develop one innovative project at a certain period of time due to large scale, technological complexity of the process, productive and financial limitations. Thus, the gates, established for making the choice between already being in development projects are simply unnecessary. Two first gates are left since on these stages still can exist any choice between ideas and concepts, additionally they do not yet require any considerable investments. After further stages the gates should be changed to project meetings, less and time-consuming where the stages' results are presented to upper management. In emergency cases, the meeting should be organized as soon as possible, regardless of current development state of the project.

Additionally, it is rationally to emphasize necessary environmental analysis preceding the "Selection of ideas" stage. The study conducted by Bstieler & Gross (2008) among 82 industrial innovative projects testified that company's external and internal conditions directly impact the outcomes of development process. The scholars concluded that those enterprises that adapting their development approaches to different environmental conditions and various uncertainty levels obtain in the result decreased time-to-market, higher quality and profitability of their innovations. In fact, analyses of both external and internal environments should be carried out by enterprises of any industry prior to making of any more or less considerable developments. However, Russian companies often neglect them or conduct just formally in order to, as they believe, save money and speed up an innovation's time-to-market (Belova 2018). Thus, good and informative model should highlight investigation of external and internal environment is highlighted into separate block in order to emphasize the importance and inevitability of them before the NPD process. Analysis of microenvironment helps to "investigate the landscape" for future innovative product. This corresponds to modern proactive market orientation concept, which suggests that in course of any strategy development a company should orient on all the constituents of its external environment, not only on consumers (Slater & Narver 1998). Still, particular attention should be given to customer analysis, since exactly its results define the direction of future innovation. Moreover, some valuable ready ideas of new product or certain improvements also may be already received from customers in course of this analysis. Secondly, during the last years dynamics of changes in Russian machine-tool industry becomes more frequent. Fortunately, these are mostly favorable movements, conditioned by intensive state assistance. Timely investigation of external environment helps to learn about new support programs for innovative companies, institutions, associations, etc. Rational application of this information can help to make innovation development process less complicated and risky for

companies. Analysis of internal corporate environment in its turn helps to reveal intra-company problems which can become obstacles for the NPD process and eliminate or minimize them. Creating of innovative products requires complete understanding of internal mechanisms, coordination of many decisions, activities, and functions (De Toni & Nassimbeni 2003). In order to realize the importance of internal business analysis can be realized from the utterance of Cravens & Piercy (2005): “business analysis is the final assessment before deciding whether to develop the concept into a new product or not.”

Graphically the suggested framework may be presented in the following way (Figure 11).

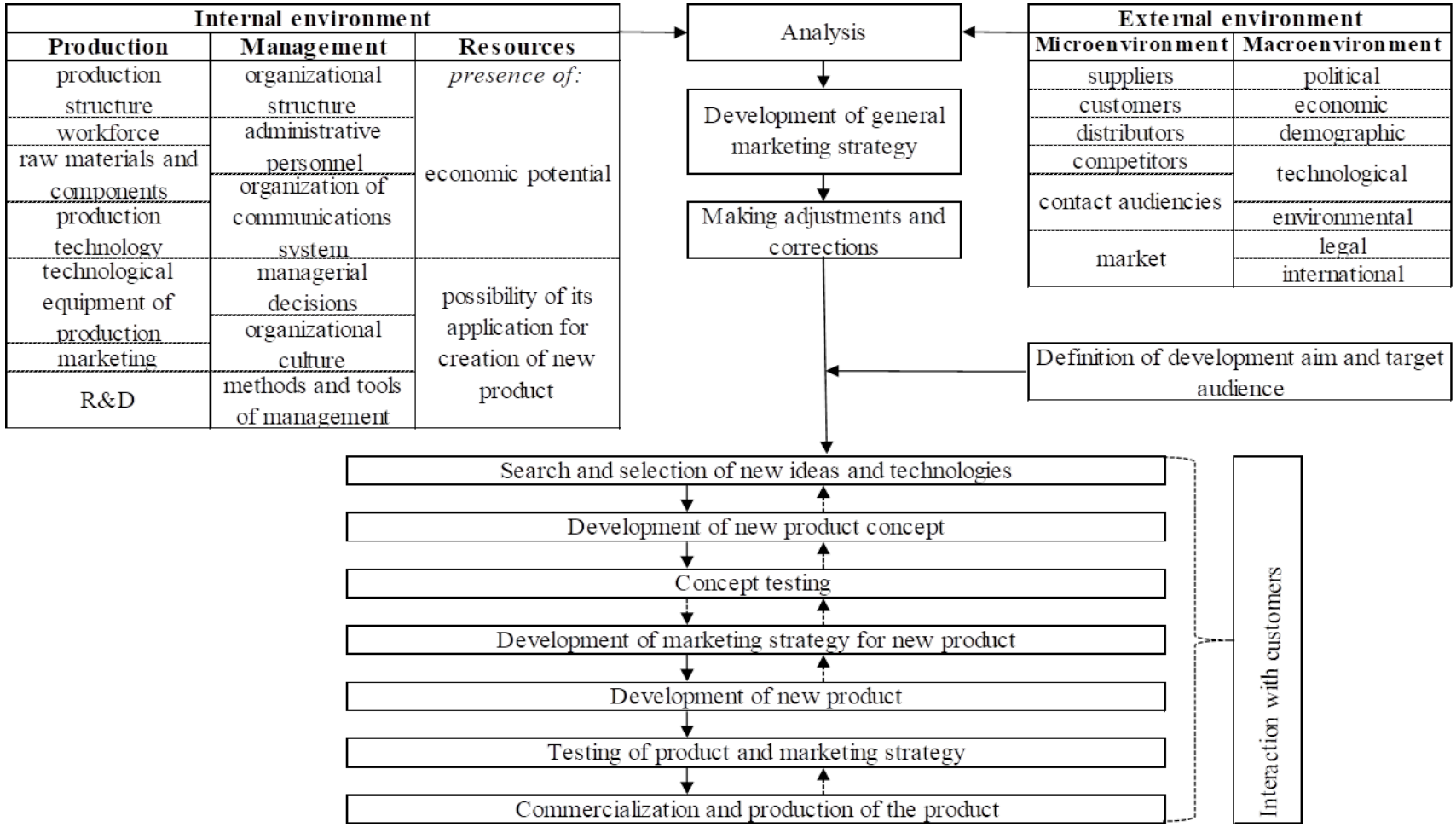


Figure 11. Modified Agile-Stage-Gate framework for development of innovations in Russian industrial companies

3 RESEARCH METHODOLOGY AND DATA COLLECTION

3.1 Methodology and justifications

The main aim of the thesis is study of marketing planning and NPD process models during in the process of industrial innovations creation on the example of Russian company and working out recommendations on their for reduction of risks during commercialization of innovations. In this regard, the objectives of empirical research suggest detailed investigation of the case company's practices related to research subject.

Research approach

In the choice of research approach Creswell (2014) advices to base it on research emphasis and nature of its topic. Thus, if on the subject there exist sufficient for formulation of theoretical framework and hypothesis amount of theoretic literature, deductive approach should be used. On the contrary, given the topic is new and debatable, it is necessary to generate and analyze data reflecting upon available implications from theoretic literature, the researcher needs to follow inductive strategy.

The study is based on inductive approach (Saunders, Lewis & Thornhill 2009, 124-127), since although analysis of academic literature from one side pointed to suggest that strategic marketing planning could be used for innovations' commercialization process's risk reduction, however, there was revealed no clear theory or framework about its application in this quality. Thus, the author chose inductive approach that can help to transform theoretical prerequisites into an operative framework.

Research strategy

For the given paper was chosen case study strategy that is "a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence" (Robson 2002, 178). It is particularly useful when a researcher wants to obtain rich understanding of studied phenomena together with the context of these phenomena (Saunders et al. 2009, 146).

Time horizon

Time horizon is the term within which it is planned to complete the research project (Saunders et al. 2009). It can be either cross-sectional or longitudinal. In the first case the studied phenomenon is investigated at a specific time, its main aim is assessment of the phenomenon's state at one certain moment. On the contrary, longitudinal time horizon supposes collection of data repeatedly over an extended period, thus, it emphasizes investigation of phenomenon's dynamics. The given research is aimed at obtaining of deep understanding not only of current

state of studied phenomena of each case but also of their preconditions and influencing factors, it implicated analysis of information from several time periods., presented by both primary and secondary data. Thus, the time horizon of the study is longitudinal.

3.2. Sampling and data collection process

Sampling

The case company was chosen with the help of purposive sampling research technique (Laerd Dissertation 2018). It is explained by heterogeneity of Russian machine-tools manufacturing companies' development and market performance levels. In particular, such characteristics as presence of R&D activities and sufficient for market launch of inventions levels of funds and performance are absent at many national enterprises. In such a situation, only judgmental selection enables answering research questions. Additionally, since the studied enterprise is comparatively more successful than majority of other Russian producers, not only the recommendations but also its current good practices can serve as benchmarks for other less developed national enterprises.

The case company was selected by the following criteria, which are listed below by the extent of importance:

- **Presence of innovative activity.** As it was mentioned above, development of innovations is a big trouble for Russian machine-tool construction. Thus, in the selection process the researcher paid attention to the companies which conduct innovative activity.
- **Sufficient market performance.** In spite of development of innovations, a company should also have enough financial means for their commercialization, since it is often fairly expensive process. Successful activity in the market ensures a company's profitability, consequently, presence of money for launch of its inventions.
- **Availability of information.** It was important to ensure sufficient amount of available secondary information about them, e.g. financial and corporate reports, press releases, news articles, etc. However, not all the companies have informative websites. Moreover, most of them are public limited companies for which, according to Russian law (Deloitte 2018), it is not mandatory to publish financial and corporate reports.

Information about existing machine-tool enterprises was taken from the website of Russian association of machine-tools producers (Stankoinstrument (a) 2018), where is presented the list of its members, information and contacts. Further pre-selection analysis of available secondary data was conducted and, finally, 8 companies were considered appropriate for the research. Here it is necessary to bear in mind that the response rate among Russian companies is typically very

low. Thus, only 3 responded to initial contact-setting message of the researcher and only one company agreed on interview and provision of data regarding the study aspects.

Data collection process

The main question of the research is: “What improvements can be done in the case company’s marketing planning in the process of innovations development in order to reduce the risks of their commercialization?” It supposes collection of mainly qualitative information because conditions and practices of the company are individual and cannot be standardized according to firm format of quantitative type of research. Proceeding from this there was chosen semi-structured type of interview (Saunders et al. 2009, 320-330), which is based on predetermined list of themes and several questions prepared in advance. Particular questions as well as their order may in different interviews, yet, they should refer to the listed topics. This approach suggests sufficient degree of flexibility and at the same time helps to keep intended structure of the conversation and not to forget important issues. Primary data collection included two interviews: one with two employees of marketing and R&D departments and the second one – with the person dealing with innovative projects. The interviews were based on list of prepared in advance topics and questions (Appendix 1). All the conversations were made via web communication software that is explained by geographical and financial conditions.

Additionally, secondary data were collected and analyzed in the process of empirical research. They were presented by financial and corporate reports, presentations for stakeholders and other internal documents and provided supplementary information about the research object for increase of research objectivity. These data were received already after collecting of primary data. They are not available for public access and were provided by the case company at the request of the researcher during the interview.

4 EMPIRICAL RESEARCH OF THE OJSC “SASTA”

4.1 Case company profile and results of empirical research

Open joint-stock company SASTA (OJSC “SASTA”) counts down its history from March 1974, when the first stage of the automatic lines plant was put into operation in Sasovo, Ryazan region (OJSC “SASTA” (a) 2018). By May 1, 1975, the first 5 lathe semi-automatic machines were assembled, and in February 1976 the plant produced the first automatic line. In July 1981, the assembly of the automatic line plant and the construction of a pipe-cutting machine factory built in 1979, the Sasovo machine-tool production association (SSPO) was formed, which also included a special design and technological office for machine-tool construction and repair and construction management. After privatization in December 1992, the association became an open joint stock company and was renamed into “SASTA” OJSC. Most of the ordinary shares (76.5%) belong to three private individuals, which account for 77.8% of the company's share capital. The size of the issuer's authorized capital as of the last reporting date of the fourth quarter of 2017 is 2,900 USD, the major share in it falls on ordinary shares (82.5%). State or municipal entities do not participate in the authorized capital of the company. The company does not have branches and representative offices, but at the same time is a member of the association Stankoinstrument (b) (2018), which unites 141 enterprises and research organizations of the machine tool industry.

In comparison with most of the Russian machine-tool, producers OJSC “SASTA”, has sufficiently strong and favorable market position. It is a large enterprise which had almost completely overcome the consequences of many-year previous recession, however, was kept its previous production experience, its current activity yields profit, it develops and launches new products and exports products to foreign markets. Even the presence of any two of these characteristics is rare for most of national producers.

The core activity of the company is a full cycle of production of metal-cutting machines: from design and casting to final assembly. Currently, the company has its own construction & design department, foundry with a testing laboratory, which provides the production of basic machine components and hull parts, blank shop with modern equipment. The company's machine park includes more than 200 pieces of equipment, among which there is a unique one. In the structure of fixed assets (as of September 30, 2017), machinery and equipment account for 60.3%, while 65.4% of them are self-depreciating. Intangible assets of the company (as of 30.09.2017) amounted to 517.6 thousand USD, 99.9% of which are design and technological documentation and equipment for the production of machine tools.

OJSC "SASTA" produces 12 groups of metalworking equipment as well as conveyors for chip removal and grinders. In addition, the previously produced models of machines are being modernized. The range of services for customers includes installation, warranty and post-warranty maintenance, repair work of varying degrees of complexity. The company pays special attention to the quality of its products that is considered the main corporate value. OJSC "SASTA" has an international certificate for the implementation of the quality system in accordance with ISO 9001.

In 2016, the company delivered 60 different machines to customers, of which 100% of the machines were shipped to the domestic market. The revenue of OJSC “SASTA” in 2016 was USD 12.8 million (in 2015 – USD 6.9 million), and net profit in 2016 was USD 3.5 million (in 2015 there was a slight loss).

In previous years, the company also supplied machine tools to Germany, Italy, Canada, Turkey, Venezuela, South Africa, Saudi Arabia and other countries. However, during the past 2016 and 2017 years foreign deliveries were not maintained. Still, OJSC “SASTA” plans to renew its foreign cooperation, however, in the author’s point of view, for successful realization of this plan, the company should increase competitiveness of its products and try to mitigate the risks of their failure.

Corporate strategy and market position

Long-term corporate strategy of the OJSC "SASTA" is aimed at obtaining leading position in domestic market, substitution of imports, consolidation and competitiveness at foreign through increase of technological level and quality of products.

In Russia main company’s customers are private and state metal-working enterprises, state-owned companies from military and defense, oil-mining, aircraft, automotive and railway construction sectors. The relationship between domestic state and private customers is approximately 60 and 40 per cent. State orders for new or improved products are received through participation in tenders and on the basis of previous cooperation.

Since domestic demand for national machine-tools is as previously insufficient, there is high competition for both state and private customers. In spite of the fact that OJSC “SASTA” is fairly competitive, it has a number of serious Russian rivals, which also have similar corporate aims, offer wide assortment of high-technology products and cooperate with leading country’s scientific and research institutions. Intensification of their innovative activity in the recent years negatively affected domestic market share of the OJSC “SASTA”. Thus, in 2012 it was about

36% and the company was the leader in Russian market. Now, it reduced to approximately 20%, that is still large, but the reduction by almost 40% during five years is alarming factor.

Characteristics of overseas clients vary according to the countries of their origin. In developing countries such as Venezuela or African countries, the products of the company are used by enterprises of all types: both state and private, medium and large. For them the central value is quality, technological effectiveness and functionality combined with affordable price. In developed countries (Germany, Canada, Italy) clients are mostly small and medium-size companies which look for inexpensive, simple and at the same time quality equipment. There is no necessity for them to purchase high-technology complex high-priced equipment of local producers. However, several years ago there started a negative tendency of foreign demand reduction and in 2016-2017 the supplies of company's machine-tools to abroad were not maintained at all, that was conditioned by additional negative influence of political tension and correspondent sanctions. The company's specialists found the cause of foreign demand decrease in the fact that leading foreign machine-tool producers started entering the market niche of more simple and inexpensive tools, yet, with the same price they can offer better technologies and functionality. They satisfy national demand for such equipment and also export it to developing countries.

Innovations and NPD process

The main stimuli for innovative activity are support of state import-substitution program, increase of provided customer value and competitiveness. In comparison to other national enterprises the company conducts intensive innovative activity: on average, it produces 3-4 incremental innovations annually and every 2-3 years it launches completely new (for Russian market) machine tools. The sources of innovative ideas of the company are its own R&D center, as well as research organizations and universities. Thus, Ryazan State Radio Engineering University (2018) develops mathematical, software and technical support for computing devices and image processing systems by orders of the company. JSC "VNIIinstrument" (2018) develops innovative technologies for high-precision machining of metal parts, as well as technologies for manufacturing of science-intensive components from nanocontaining materials; Stankin Moscow State Technological University (2018) ("Stankin" MSTU) – computer-aided design systems for machine tools, technologies of machining and plastic deformation. Additionally, some products are based on technologies copied or transferred by foreign companies in the course of partnership aimed at reduction of technological backwardness of Russian machine-tool industry. However, from 2014 tiring and maintenance of such relationships became very difficult that is again due to unfavorable political conditions.

In the process of innovations development OJSC “SASTA” does not follow definite framework or model, yet, in its typical NDP process can be conditionally defined the following stages:

1. Selection of several (usually 2-5) ideas for new or improved machine tools in the course of collaboration of company’s R&D specialists and engineers with scientific and research institutions.
2. In-company assessment of commercial potential of each of initially selected ideas. It is performed by employees of R&D, financial and marketing departments and includes analysis of existing similar competitors’ products, technology usefulness and simplicity of copying, relevance of new product for customers, target market capacity, assessment of funding necessary for development and potential ROI. (Straightaway it is important to note that correspondence of the innovation to customer needs is assessed on the ground of secondary data possessed by company’s marketing department e.g. previous studies of customer behavior and characteristics, customer responses on existing products, general demand for different kinds of machine-tools in the industry, foreign market trends, etc.).
3. Selection of one final idea, development of new product concept, concept testing. Usually there are tested only the concepts with high degree of novelty since they implicate more uncertainty for the company. In this case the company organizes focus-group meetings of its technical specialists with 2-3 experts of partner companies or proficient representatives of partner organizations where they can discuss potential of the concept and provide advice for possible supplements. In case the results of this tests are unsatisfactory, the concept is either corrected or rejected.
4. Creation and approval of the development process plan and cost sheet, allocations of funds. If concept testing outcomes are good enough, product development plan and estimates of costs are elaborated by R&D and financial departments for higher management. In some cases, the plans are corrected, most often managers insist on decrease of the process’s duration and funding that is conditioned by their fears that competitors can outrun the company and frequent financial limitations.
5. Selection of development team members based on their competencies and current workload. In the beginning of the NPD process this team is usually formed from employees of technical departments: R&D, production and IT.
6. Development process. On average development takes 3-6 months for incremental innovations and 10-24 months for absolutely new (for the company) machine-tools. Approximately in the middle of this process are got involved employees of other departments (marketing, logistics) so that they are able to produce detailed pricing, communicative and distribution strategies to the moment of new product readiness.

7. Testing of ready new product. Firstly, each developed product passes through testing in laboratory conditions. Regarding market testing, OJSC “SASTA” has two options for conducting of this procedure. Thus, for most considerable innovations, the company seeks to organize customer and expert testing at different industrial trade fair since there is always sufficient amount of qualified participants, additionally, new products at once gets much publicity that promotes new customers’ contacts and orders. In case there is no such an opportunity, as well as for testing of incremental innovations and improvements, special video reports, which contain detailed demonstration of new product in working conditions and explanation of its characteristics and benefits which it could provide, are prepared and sent to clients and independent experts by e-mail with several necessary technical documents. The company explains such approach by geographical remoteness of customers that will make standard face-to face testing procedure time-consuming for clients and expensive for the enterprise, thus, management supposes that the response rate would be very low. In addition to video materials and at the trade fairs customers are provided with questionnaires where they have to assess demonstrated product, express their opinion of it and possible suggestions. Basing on the survey results the company decides whether the product should be corrected and/or supplemented with other additional functions. The decision criteria are the number of similar customer responses/suggestions (≥ 30 % of all the participated clients) or similar opinions of 3 or more experts. In such an event the product is reworked and then passes through repetitive testing.

Commercialization process

After successful passing necessary tests innovation is launched in production where is manufactured the first batch of machine-tools. Simultaneously with it marketing department places information about new product on the company’s website and lists of product assortment for customers. Besides other communication channels, such as magazine or web articles with industry news are used.

The company’s specialists consider level of demand, possible negative after-sale responses, problems with distribution to be the riskiest aspects during and after the commercialization process. Pointing out of these risks is conditioned by previous negative experience.

Thus, in one case the company faced unexpectedly low demand for its innovative sufficiently improved machine-tool. It belonged to medium category both in regard to price and functionality and the company started selling it at price fairly correspondent to functionality and provided

value. After conducting several analysis marketing experts of the OJSC “SASTA” found out that one of the competitive enterprises offers a slightly less functional machine-tools under much lower price following market penetration strategy. Since setting of even lower price than that of similar product was profit-losing for the company, it had to stop manufacturing of this model, for its further modernization with additional functions and launch already in upper-price segment. The second attempt was successful, yet, these activities cost much for the OJSC “SASTA”.

Another issue occurred when the whole product line of one of the first company’s CNC-controlled machine-tools was removed from assortment and sent to rework. The reason for that became a big number of customer complaints regarding low-power microprocessor with insufficient memory, inflexible software and several inconveniences during the working process due to problems with ergonomics. These products were improved and later launched under another model name so that to avoid negative associations.

The company’s specialists analyzed former failures and suggested the following actions to mitigate these risks in the future (Table 5).

Table 5. Commercialization process’s risks and preventive measures of the OJSC “SASTA”.

Problem	Preventive measures
Uncertain level of demand for new product.	Production of only one batch of the products in the beginning of market launch with further adjustments in accordance with actual demand.
Customer dissatisfaction with new product’s performance.	Conducting of pre-launch testing.
Failure due to actions and strategies of competitors.	Analysis and account for competitors’ strategies in relevant market segment during assessment of commercial potential of new ideas.

Successfulness of an innovative product’s commercialization is usually assessed after half a year after its market launch. For this aim the following indicators are applied by the company’s specialists:

1. Revenues and ROI.
2. Market coverage.
3. Share of product in total turnover.
4. Growth rate of the turnover.
5. Percentage of trial and repeat purchases.
6. Share of new customers.
7. Frequency of purchases.
8. Number of customer complaints.

OJSC “SASTA” also organizes web customer surveys, which assess customer treatment to all the company’s products in general, not separate ones; however, customers there are provided a

possibility to express their opinion about a particular product. Some of the suggestions from such surveys are used as ideas for incremental product improvements.

Marketing planning

OJSC “SASTA” conducts complete market research every 2-2.5 years. It considers definition and assessment of external factors, matching of them with internal potential, studying of technological tendencies in the industry, study of possible changes in customer behavior. Basing on these analyses general marketing plan is created where are defined company’s target audience, market and common marketing mix for the company’s products. Separately are conducted brief analyses of foreign markets of the countries where the company exports its products. On average, marketing expenses compose up to 7% of the company’s revenues.

Functional plans for groups of innovative products or separate new machine tools are developed on the basis of the main plan. In general form marketing mix of the OJSC “SASTA” can be described as follows:

Product. The company offers wide range of metal-cutting machine tools of different allotment (detailed assortment is described in Section 2.2 of the given paper). The products are standardized, however, recently OJSC “SASTA” started to work up customization direction. Thus, in the former year it added a possibility of minor modifications of semi-finished product batch in accordance with particular customer’s specifications. The company provides basis after-sales services, such as installation and setting, maintenance and repair, as well it offers customer education programs. The main emphasis in positioning of all company’s products is their quality, reliability and outstanding (for Russian market) level of technology.

Price. The basic pricing strategy of the company follows variable cost pricing principle where the price of each product is determined by the expenses of its production and special markup coefficient. The latter depends on profitability of the company's costs calculated on the basis of the results of the previous period.

Place. In the company there are two fundamentally different kinds of organizing product distribution channels. The first (direct) provides for the organization of sales through the efforts of the company and is applied in the region of its operations (Central Russia) The second (indirect) supposed cooperation with distributors and is used for deliveries to remote part of the country (Far East, the Ural region, North-Eastern region, etc.). Delivery of products abroad was conducted with the help of national logistics company. OJSC “SASTA” admits that indirect channel is currently underdeveloped and causes many issues such as attempts of the distributors

to change the prices for company's products although that is not provided by contract, lack of distributors' loyalty and their desire to set all cooperation conditions that is explained by the facts that they have many clients, including foreign companies, and national producers are not treated as priority.

Promotion. Objectives of the company's communication policy include:

- Formation of favorable image of the company;
- Informing the public about the company's activities;
- Maintaining friendly relations between the company and its contact groups;
- Formation of the buyer preferences to the company's products and prompting them to make a purchase.

The main communication channel is corporate website where is presented general information about the enterprise, product assortment and service range, investor reports, company's news and releases of its innovative products. Direct mail is applied for communication with regular clients. Additionally, OJSC "SASTA" participates in large national trade fairs where it demonstrates results of its activity, contacts potential new customers and business partners.

4.2 Empirical data analysis

The given section is aimed to analyze the results of empirical research referring to the conclusions and outcomes of theoretical materials review and consideration of the company's market environment. The paragraph is also divided into subsections as according to the investigated categories: strategy and market position, innovations and NDP process, commercialization of innovations and marketing planning.

Corporate strategy and market position

Provided information made it possible to conclude that the main company's problems in the markets of its operations are:

- Increasing number and power of national competitors, consequent loss of market share.
- Still fairly high level of foreign competition in spite of state protective measures and users' preference of foreign machine tools.
- Negative influence of macroenvironment (political tension and sanctions)
- Low competitiveness in foreign markets.

Thus, even given not all these factors can be influenced by the OJSC "SASTA", the most effective way of improving such situation is the increase of company's products competitiveness and attractiveness for customers that will stimulate demand and help in the contest with foreign and national rivals.

Innovations and NPD process

The process of innovative products development in the OJSC “SASTA” represents common waterfall approach. It is similar to Stage-Gate model (Section 2.3) in regard to number and sequence of stages, however, the company does not apply the core element of this framework - “gate” system, thus, there is no organized order of each stage’s results analysis. Therein OJSC “SASTA” bears increased risk of continuation of unprofitable or already irrelevant projects and suffers inflexibility of development process since absence of such assessments deprives it from the possibility of timely recognition and mitigation of a project’s disadvantages. Moreover, the common disadvantage of all the stages of the company’s NDP process is lack or absence of necessary marketing analyses that are described in Table 1 of the given paper. Such a neglecting generates most of the possible risks and problems connected with further launch and sale of innovative products.

Detailed examination of each stage’s process with account for theoretical implications allowed reveling the following substantial drawbacks.

The first mistake is almost missing customer orientation during ***selection of ideas*** process. The main company’s sources of innovative technologies or ideas are cooperation and inventions of state research institutions, while customer involvement and cooperation with them is absent or very rare (only for several incremental improvements). At the same time, definitely they are the cornerstones of future product’s success in industrial markets (Cooper 2004). Moreover, initially the ideas are selected without participation of marketing specialists, only by representatives of technical departments who may have blurred view of actual market tendencies, changing customer preferences, etc. and skip really valuable technologies or ideas. Marketing specialists get involved only on the second ***internal selection*** stage, thereby they are put before already limited number of alternatives. Referring to their further performance during this stage, it also leaves space for making improvements. In particular, the fact that assessment of customers’ treatment or perception of one or another idea is conducted only through application of secondary data, which in fact do not reflect the actual state, however, only its possible projection. New product concept testing is as well conducted without real participation of customers. Although the company justifies it by previous negative experience of customer revealing of certain valuable data to competitors, its mistake was not the decision of organizing testing itself, rather including too specific and detailed information in the questionnaires, while it is enough to make general product description and list performed functions and benefits of intended product without specifying any data about its technological basis. Another drawback refers to ***formation of project team*** which in the beginning includes only technical specialists, yet, multidimensional

collaboration is considered the most effective way for managing technologically complex NPD projects (Donnelon 1993). Regarding the ***project approval stage***, here possible mistake of management is the cutting down of time and financial resources, as it may negatively influence new product's quality. From the other side, in some cases such decisions can be reasonable. The method of ***ready products market testing*** by sending of visual presentations and technical documentation is also arguable, in spite of its seeming attractive simplicity, it hides very unfavorable consequences. More in detail it is described in Table 6 below.

Table 6. Benefits and possible consequences of the company's market testing approach *(Source: designed by the author).*

Benefits	Possible negative consequences
Convenient and simple to conduct	No opportunity for customers to get physically familiar with new product, increased risk of false perception and assessment
Significant savings of valuable time, faster time-to-market	Different impression upon purchase and use of the product, dissatisfaction and complaints
Economy of funds on organizational and transaction costs	Significant reduction of demand soon after or some time later market launch
Higher response rates	Decrease of customer loyalty, negative word-of-mouth

From the table it is seen that although application of the given way of testing is justified by geographical conditions as well as frequent financial limitations and low customer involvement that are faced by many Russian industrial producers, risks of its application provoke much higher costs than spending on organization of traditional face-to-face market testing. Customer response in its turn can be also influenced with the helps of marketing techniques that is in detail examined in Section 3.4 of the given paper.

Commercialization process

Organization of innovations' market launch itself as it was described by company's representatives does not involve serious drawbacks. However, specified problems and failures of former commercialization processes are caused by bug amount of false approaches during the NDP process, especially in its early stages, nonetheless, definitely on them the success of future new product is grounded. The company's counteraction measures are either simple adaptation to consequences as in case with production level adjustments or incorrect and insufficient like applied testing methods.

Examination of the NDP process revealed only part of commercialization problems' reasons that can be mitigated within the powers of the OJSC "SASTA", another part occurs due to drawbacks in company's marketing planning as discussed below.

Marketing planning

The first drawback in the company's marketing planning itself is rarely performed market research. Only one investigation in 3 years is not enough for innovative company performing in continuously changing technological and market conditions and pretending for foreign market presence. Fostering of national industry development is another ponderable reason for frequent analysis because it not only creates new opportunities for the OJSC "SASTA" of which it might not learn without market investigation but also activated development of the company's competitors.

Product strategy is a strong element of the company's marketing mix not only due to broadness and innovativeness of assortment, but also thanks to making first customization attempts and providing wider (in comparison to national competitors) after-sales services, that is highly appreciated by clients. Here, in the author's opinion, it is necessary to continue implementing customized products and add as well pre-sales services such as providing advice for choosing of most appropriate machine-tools which will help customers feel more secure with their choices especially in case with highly innovative products.

Pricing strategy. Applied variable cost-based pricing approach is not very appropriate for an innovative company since "it does not take into account so called "intellectual rent" which innovative producers want to receive until competitors have not produced similar products and as well compensation for their R&D expenses" (Romaniuk 2018, 4). Other risks of this approach are growing expenses and unsubstantiated markup level. Finally, it does not account for customers' interests e.g. receiving of new quality for correspondent price at all, since due to abovementioned risks the product can be overpriced.

Distribution strategy. The company's distribution strategy seems fairly correct – combination of direct and indirect channels helps to maintain certain level of control and at the same time expand the delivery zone to remote regions in the conditions of lack of funds for establishment of additional facilities there. The specified distribution problems are not the faults of the OJSC "SASTA" itself, rather problems posed by national distributors on the enterprise. In such a situation the only rational way out is improvement and toughening of distribution partners selection procedures. Though it does not guarantee absolute absence of difficulties, it can significantly increase its probability.

Communication strategy. Accomplishment of the company's communication strategy is active participation in trade fairs and openness for industrial mass media that makes it notorious for potential clients and partners. Corporate website, in comparison with majority of national competitors, is sufficiently informative and has convenient design – here one can find not detailed information about the company, production, assortment, services, recent news, press releases and several public documents, that is already much for an average Russian producer. Its big disadvantage from the position of a company claiming for foreign market presence is the absence of proper English version, that, deprives overseas customers from receiving of significant share of information. At the same time all the promotion strategy of the OJSC "SASTA" has two serious drawbacks – significant lack of digital marketing channels application and customer involvement. The company applies only direct mail channel, however, it still implicates low level of customer interaction and response rate, time delays in receipt of the feedback (Fariborzi & Zahedifard 2012). OJSC "SASTA" does not take advantage of social media marketing (SMM) and does not have an account in any popular network. At the same time this channel can strongly improve customer orientation and relationships, increase efficiency of promotion efforts and customer engagement. SMM, not so long ago discovered by B2B companies had already gained deserved popularity: a survey of 115 B2B marketing specialists found that 79% rated social networks as the most effective marketing channel, with 38% of them stated that if they had extra funds, they would spend it on social media (Chaffey 2018).

4.3 Recommendations on the NPD process and marketing planning optimization

Basing on strategic aims of the and acute problems of the OJSC "SASTA" one can state that current tactical market objectives of the company in regard to its innovative products are increasing of their competitiveness and reduction of risks of demand decrease or absence.

The core reasons of actual commercialization problems are contained in the company's NPD process, in particular, strong lack of attention and formalization of marketing activities and very low level of customer involvement during the process. Part of the issues are conditioned by quality of marketing planning and strategies themselves e.g. infrequent and incomplete market analysis, incorrect, in the author's opinion, pricing strategy, serious shortages of communicative strategy.

Recommendations for the company are divided into two blocks – NPD process including necessary marketing planning elements and suggestions for marketing strategy optimization.

New product development process

As it was stated in Section 2.2 of the given paper, before the start of the NPD it is highly reasonable to execute the analysis of external and internal environment, as their state can influence selection of that or another innovative idea for development, timing of the project and even target audience (for example, revealing of new unserved and perspective market niche). Figure 11 presents the framework for pre-development environmental analysis for the OJSC “SASTA”. In bold font are highlighted those elements to which the company should pay particular attention due to specifics of its current conditions.

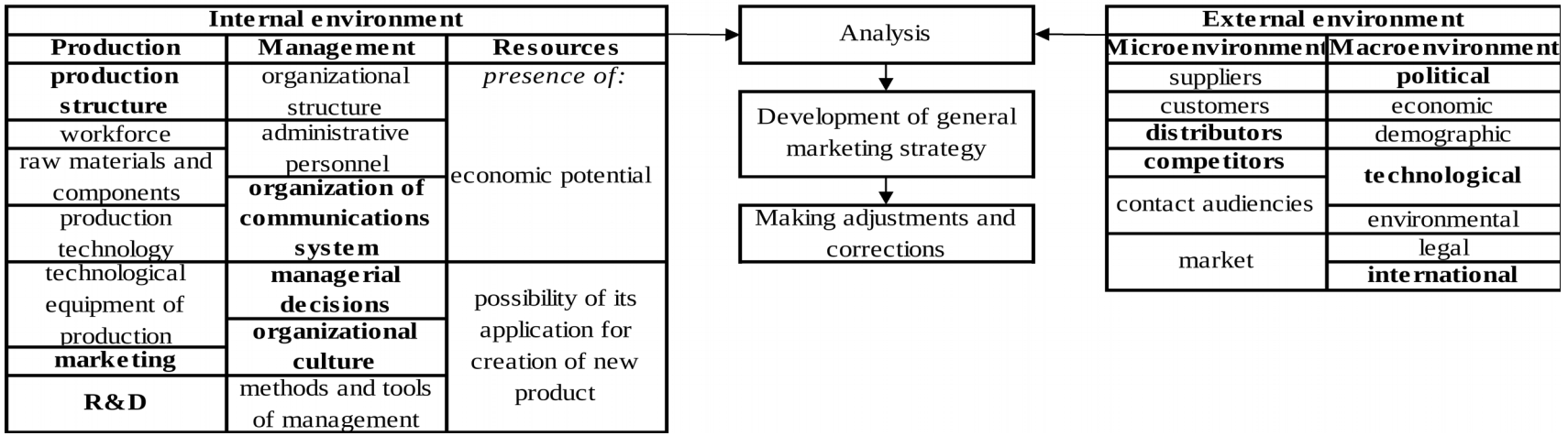


Figure 11. The model of external and internal environment analyses for the OJSC “SASTA”.

Certainly, there is no need to conduct such an extensive analysis prior to each development project, given the fact that the company launches more than one incremental innovations annually. However, it is highly recommended to execute it once a year so that its results are up-to-date and accounted during new products development. In addition, the company should continuously execute brief monitoring of its most vulnerable constituents (technological, political environment, distributors, competitors, etc.) on the subject of possible unexpected changes.

For the analysis of external macroenvironment it is suggested to apply PESTEL-Analysis; for microenvironment – Porter's 5 Forces model that measures the tension of the industry's conditions in terms of intensity of struggle between the company and 5 competing forces: customers, actual competitors, potential competitors, suppliers and products-substitutes (Porter 2008). In the former, one particular attention of the OJSC "SASTA" should be drawn to political and technological factors; in the latter – to the study of distributors and competitors.

For the study of internal processes it is highly advisable to apply value chain analysis (VCA) framework (Porter 1985, 11-15) that is based on the idea of presenting manufacturing (or service) enterprise as a system, which consists of subsystems each with inputs, transformation processes and outputs, which involve the acquisition and consumption of resources – money, labor, materials, equipment, buildings, land and management. This model helps to analyze how particular organization's activities corresponding to each subsystem contribute to creation of value for final consumers, competitive advantage and reduction of production costs.

Further, on the basis of these analysis necessary possible adjustments are made in several unsatisfactory elements of internal environment since they are in the zone of the company direct influence. Presently such adjustments should be directed to improvement of internal communication quality, since real-time continuous availability and cooperation between all the company's functions is vital in rapidly changing conditions of its activity. Currently any common communication system is absent at the enterprise, thus, it is suggested to implement web-based internal network that can serve not only as a channel for connection between the company's members but also as a database with electronic versions of important documentation that would also speed up access to necessary information and, as a general outcome raise the speed of response of the OJSC "SASTA" to changes of external environment. On the national market there already exist many companies (INTRANEXT 2018) offering both standard and customized solutions for internal portals and automatization of business processes for companies of different sizes and industries.

Since it is impossible to correct all the unsatisfactory aspects in short period of time, their actual state should be also counted upon during the elaboration of the company's business and general marketing strategies.

After the analyses and necessary adjustments it is already possible to proceed straightforwardly to the NPD process that is shown in Figure 12 below.

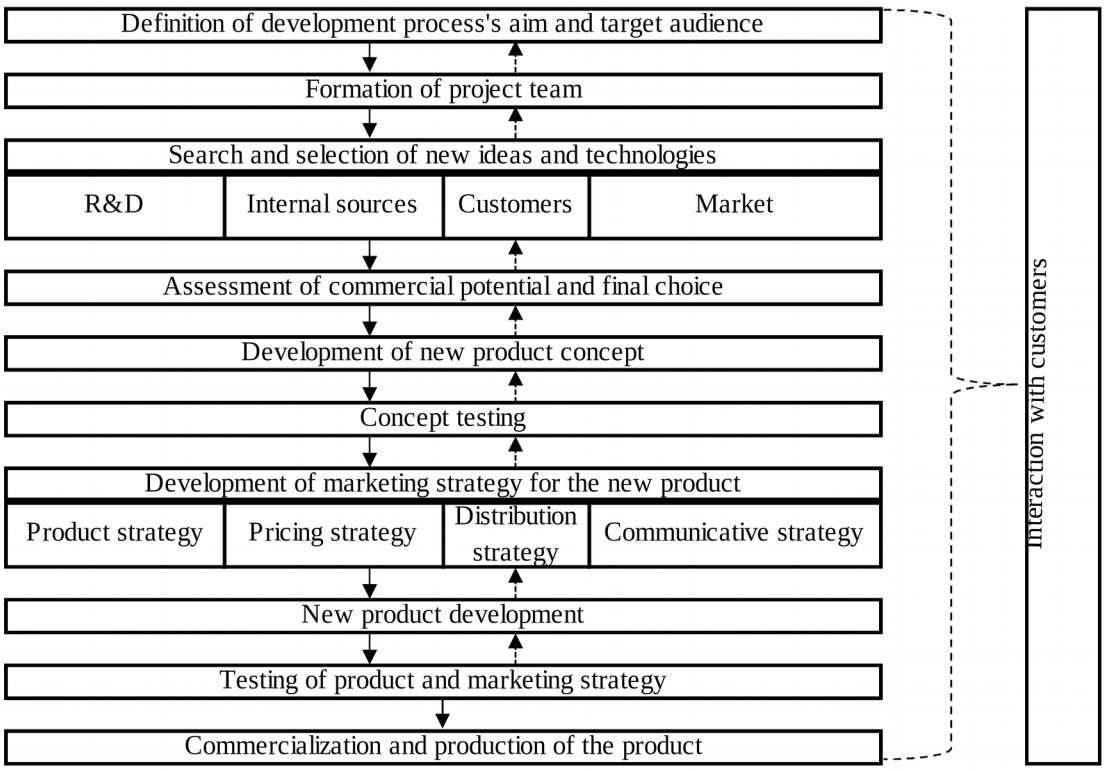


Figure 12. NPD process suggested for the OJSC "SASTA".

In the authors opinion, it should be firstly supplemented with two stages – "Definition of the process's aim and target audience", "Formation of project team" and "Development of marketing strategy". In fact, these activities are somehow or other performed during the enterprise's NPD, yet, the analysis revealed their insufficient quality. Placing of them to separate stages shows their correct order and attracts particular attention. Pointing to the "interaction with customers" block is highlighted in dotted line since according to empirical data it is extremely difficult and not always viable for the OJSC "SASTA" to support involvement of consumers strictly at each development stage, that is inherent to many domestic producers (Section 2.4). Yes, interaction with potential users is highly required on the first and third stages, as well as during any testing phases

The suggested model is applicable for both completely new and improved products. In the second case it can be reduced that is described in the explanations below.

1) Definition of its aim and intended target audience should be the first step of the development process, whatever the degree of a product innovativeness is, as the company's customers are heterogeneous. Currently common target audience of the company is fairly correct and can be kept in its actual composition:

Domestic customers: private and state metal-working enterprises, state-owned companies from military and defense, oil-mining, aircraft, automotive and railway construction sectors.

Foreign customers: metal-working companies of all sizes and types in CIS, South America's and African countries, small and medium-size mostly private enterprises from Europe.

These customer groups have differences and specification of their needs and preferences, this is why specialists of the OJSC "SASTA" should understand for whom the innovation is developed and what are the intended results.

2) Formation of development team is conducted directly after and on the basis of defined aims and audience that become the core decision criteria for selection of specialists with necessary competencies. Earlier the company also oriented on the workload of its employees by day-to-day tasks, however, this is the question of company's priorities between those assignments and creation of innovative product.

Project team should from the very beginning be multifunctional and include specialists from marketing, logistics and financial departments whose opinion is already required on the first selection stage. They can be less in number than traditional representatives of technical departments, still, their presence is obligatory.

3) Selection of ideas. For the OJSC "SASTA" there are suggested three main sources of ideas: scientific and research institutions, internal sources such as inventions of company's own R&D center and employees' suggestions, customers and market. The market source implicates technologies received from national and foreign partners in the course of strategic partnership, ideas obtained during investigation of products from machine tool or relative industries. Here it is important to note that the latter case is not about simple direct copying of ideas, however, using them for as a basis for further independent research and creation of own technologies. Application of two latter sources will significantly increase company's orientation on customers and market, thus, the success rates of its new products.

Table 7 below presents most probable degree of innovativeness of ideas/technologies from each source and the ways of receiving of information from them. Thus, depending on the defined process's aim the company can pay more attention to one or another source.

Table 7. Sources of innovative ideas and technologies for the OJSC “SASTA”.

Source	Probable degree of innovativeness	Ways of obtaining information
Scientific and research institutions	Medium to high	Cooperation, conferences, joint projects
Internal sources	Incremental to high	Research and development activities; fostering and providing incentives for employees’ suggestions
Market	Incremental to medium	Cooperation with leading producers (organizational learning), open innovations, study of existing products and trends
Customers	Incremental to medium	Surveys, focus-groups, analysis of feedback on existing products

This stage should be conducted in close collaboration of all the team members in order to ensure selection of quality ides corresponding to criteria of all functions responsible for new product, not only technical.

5) ***Assessment of commercial potential and final choice.*** After selection of several (3-6) most valuable ideas, it is advisable to estimate commercial potential of each of them. For this aim the author suggests application of the framework presented in Table 8. Here are suggested two assessment options – detailed for highly innovative ideas and express for ideas of incremental improvements. The framework implicates 5 dimensions for evaluation of new ideas and technologies: customers, market, quality of the idea itself, competitors and resources. Such complex assessment promotes final choice of the idea that is valuable and relevant from the point of view of all aspects connected with its future sale.

Table 8. Assessment of commercial potential for highly innovative or incrementally improved

products.

Dimension	Detailed assessment structure	Express assessment structure
Customers	• Assessment of customers' needs and preferences • Diagnostics of customer motives of switching from existing to new products	• Characteristics of target audience • Assessment of preferences
Market	• Determining of the market size, its tendencies and dynamics • Diagnostics of entry barriers	• Evaluation of market size
Competitors	• Identification of main competitors, their suppliers and consumers • Analysis of strategies and interest of competitors in particular market segment for which an innovative product is proposed • Analysis of competing products • Evaluation of the nature and level of product benefits	• Analysis of similar rival products • Analysis of the idea's benefits in comparison with existing similar products
Idea / Technology	• Analysis of working prototype and its scalability • Analysis of the possibility of independent implementation of the development from other projects • Assessment of the ease of copying the proposed product / technology by competitors • Analysis of the possibility of identifying authorship and providing patent protection	• Assessment of the idea's usefulness for customers • Analysis of necessity and opportunities of patenting
Resources	• Analysis of feasibility of development on existing or available equipment • Analysis of reserves of necessary staff. • Analysis of sources of financing • Cost analysis of technology (cost structure, forecasted price, expected profit)	• Cost analysis

It is necessary to take cognizance of the fact that the assessment of "Customers" dimension should be executed only with real participation of clients rather than by secondary data. For this aim it is advisable to apply the analyses suggested by Nagorny (2013, 168) such as method of control questions; method of filtering criteria; methods of rating ideas; method of the evaluation scale; marketing research of consumers. They can be organized in the form of quantitative web surveys through new suggested above communication channels.

5) Development of product concept. On this stage the prototype, technical characteristics and general design are elaborated. Additionally, preliminary positioning strategy and rough

estimation of required funding are defined. Thus, the stage should also be performed by the team cooperatively so that none of suggested new product's attributes contradicts with another ones.

6) Concept testing and approval. Testing of new product concept should be obligatory performed with participation of company's customers both for significant and incremental innovations. Taking into account the remoteness of majority of clients from the OJSC "SASTA" and the fact that on this stage testing object can be simply represented in electronic form, it is advisable to organize this procedure through web communication channel as which can be used the recommended above ("Communication strategy" paragraph of the given section) customer portal of the company. Information about the intended product can be presented in the form of videos, pictures or verbal descriptions. However, this information should not contain any important technical details that can be disseminated by unprincipled customers to rivals as it was the case with company's previous testing. Thus, complicated but necessary task of the project team is selection and presentation of such data that show customers essence and novelty of the product and at the same time do not contain anything valuable for competitors. Currently applied focus-group testing should also be retained, however, for incrementally improved products this procedure can be conducted without external specialists.

Given successful passing of this stage, OJSC "SASTA" should ensure its rights on innovative idea or technology. It can be either purchased or documentary transferred from partner organizations or, in case the technology is company's own invention, it should apply for patenting it to country's legal organizations already after this stage. Thus, since the procedure of patent receipt usually takes 2-4 months, it will be finished to the moment of market testing phase e.g. launching of the technology implemented a new product to the public.

7) Development of marketing strategy for an innovative product. This strategy is a modification of the general marketing strategy described above. Differences of such strategies from each other hinge on target audience (for example, domestic customers or foreign clients in either developing or developed countries) and concern product itself and accompanying services (to some extent); distribution strategy depends on locations of target audience; pricing strategy may be either standard (based on provided value), skimming or penetration contingent on the company's aims for the given product and market segment. Emphases of communicative strategy are defined by the extent of product's novelty e.g. for significantly innovative products are suggested to be promoted mainly during trade-fair and exhibitions, in web or print articles of industrial media; incrementally improved products – through direct mail, social networks and customer portal.

Marketing specialists should pay attention to the fact that this strategy is designed prior to the product development with the assistance of team members from logistics and financial departments. Draft of this strategy may be prepared already during the development of product concept.

8) New product development. This stage is executed by technical departments. In case the process is extensive and characterized by considerable amount of work, it should be divided into sub stages with team meeting and joint discussion of the phase's results, possible problems and development of solutions to them.

9) Testing of new product and marketing strategy. Firstly, it is necessary to conduct laboratory testing of the product in working conditions. Referring to market testing, in spite of the fact that the company's management considered face-to-face customer testing senseless and expensive, due to supposed low response rates, it is advisable to start attempts of inviting customers for presentation and trial use of newly issued machine tools. Firstly, many customers are located in the central part of the country that is not far from the OJSC "SASTA"; secondly, the company has sufficient number of clients and, even given low response rates, number of participants is enough for the procedure. The invitations can be done even in a short video format as an application of project team to a client, that will increase its personal orientation. The second recommended method is previously used organization of testing during industrial trade-fairs with participation of both potential customers and industrial experts.

10) Commercialization and launch of new product. Here is conducted preparation and adjustment of production facilities, order and delivery of necessary materials from the suppliers, manufacturing of the first batch of new products (further production volume should be adjusted to the level of demand as it was previously done in the company), inclusion of the product to official assortment, intensive implementation of developed promotion strategy. Results of the process are recommended to be measured after 3-5 months from market launch with the help of financial indicators and customer surveys.

Marketing strategy for innovative products

Product strategy. The company's product assortment consists of different turning and pipe-cutting machines for different purposes, as well OJSC "SASTA produces customized tools by customer orders.

Service range of the company can be divided into services connected with sale of products and other services.

Sales-related services include 3 categories:

1. *Pre-sales services:* analysis of customer production facilities, consultation and advice on the choice of best appropriate equipment; providing of trial usage periods.
2. *During-sales services:* delivery; installation & setting; learning of customers' personnel.
3. *After-sales services:* technical inspections and maintenance; delivery of spare parts, repair.

Other services include repair, modernization and production of customized spare parts for machine-tools of other producers, casting of metal parts, high-precision laser cutting of customers' blanks.

Pricing strategy. It is suggested to change current variable cost-based pricing approach of the company to comparative approach (Romaniuk 2018) where prices of new products are determined by their customer value. In the case of innovative products for production and technical purposes, all the methods used for a comparative approach to pricing are based on a comparison of a new product with products of the same functional purpose by individual parameters or a combination thereof. The price of a new product in the general case is determined by the equation:

$$P(n) = P(b) * f(X1, X2, ...),$$

where *P(n)* – the price of a new product; P(b) - the price of the best analog product;
f (X1, X2, ...) is the dependence relating the characteristics of the new product and analogue products; *X1, X2, ...* – the parameters of products comparison. The function *f (X1, X2, ...)* in the expression takes different form depending on the number of parameters for which an estimate is made, and the methods of evaluation (quantitative, graded, expert, etc.).

Comparative approach to pricing for new products reflects the interests of both the producer and the consumer. In particular, the *P(b)* factor reflects the prevailing price of previous generations products for similar purpose, that already contains market-defined producer's costs and profit (that is, the coefficient takes into account the interests of an innovation's producer), and secondly, the prevailing level of existing product's price is already acceptable to the consumer (that is, the interests of the consumer are taken into account). In addition, the second factor in the expression, the function *f (X1, X2,...)*, simultaneously reflects improvement of the utility, value of the new product for the consumer, as well as the need to compensate the producer for any additional costs incurred by ensuring customer's profit.

Risks connected with this approach include false determination of the parameters' value (usually in case of expert estimation) and absence of existing similar products for comparison. Yet, the former risk can be mitigated through application of quantitative methods of assessment, while

the latter one is almost absent for the OJSC “SASTA” because in the machine-tool industry even the products with considerable degree of innovativeness are improved versions of existing products.

Distribution strategy. It is suggested to keep current application of mixed distribution channel in Russia and cooperation with logistic companies for foreign deliveries because this approach is the most relevant and high-grade. However, selection criteria for partners should become tougher and consider the following aspects (Kalygina 2013, 14-15):

- distribution capacity and territorial coverage;
- professionalism, competence and market reputation;
- number of other suppliers and strategic priorities;
- financial position and the ability to fulfill established procurement plans;
- experience and results of past periods;
- warehouse of the distributor (Are existing warehouses suitable for storing of the products? Is there an opportunity for the distributor to maintain the necessary level of stock?);
- assigning a separate manager to the supplier's brands;
- frequency of the distributor's training programs for his staff;
- relationship of the distributor with the local media.

Distribution strategy can be either limited selective (3-5 partners) or exclusive (1-2 partners) depending on the customers’ locations and distributors’ service areas.

Communication strategy. In the first turn, the company should intensify the use of digital marketing, in particular, social media channels and create its business accounts in most popular national and international social networks for sharing of company’s news in online mode, informing about and promoting its products to existing and potential customers. In addition, such company’s webpage implicates constant independent interaction between the customers in the form of open dialogue on company’s activity-related subjects, thus, it can continuously conduct unintentional focus-group online-survey. Secondly, it is vital to create full-value version of the corporate website so that national and foreign customers receive equal information. Finally, the company is advised to create web-based portal with limited access for private communication of the company with its customers. There each registered customer will have a personal account in which all his documentation (orders, payments, invoices, etc.) is kept; registration on the portal is conducted with the help of responsible employees of the company. In difference from social networks public webpages, such portal can be applied for conducting of serious surveys, for example, selection of new product idea or concept testing. Finally, 1-2 competent representatives of the OJSC “SASTA” should be constantly available online for conversation and assistance.

Basing on the suggested recommendations, the full cycle of new for the company's market product development can be graphically represented on Figure 13. It reflects both the implications provided in Section 2.4 and the company's peculiarities.

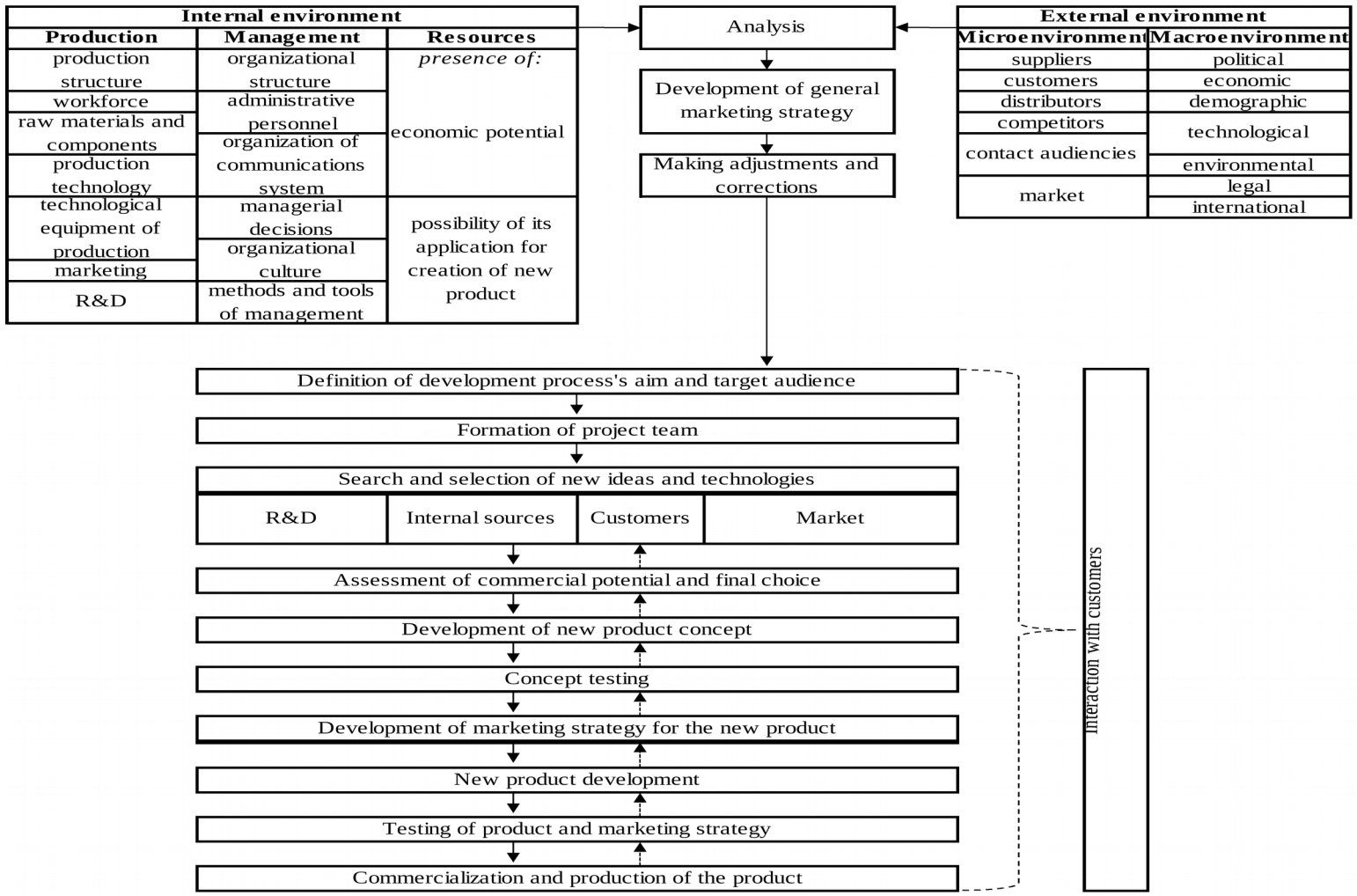


Figure 13. Full cycle of new product development for the OJSC “SASTA".

5 DISCUSSION AND CONCLUSIONS

The main aim of the thesis was the study of marketing planning and NPD models for creation Russian industrial innovations and development of recommendations on their optimization The research was performed in the context of national machine-tool industry on the example of the OJSC “SASTA”. In this chapter is presented discussion of the research findings, their implications to theory and earlier studies of marketing planning and the NPD process as well as their correspondence to general national and industrial statistics.

5.1 Implications to theory

Findings of the empirical research suggest that the company’s problems to much extent reflect present state of national machine-tool construction e.g. demand for domestic products, remaining high and tough foreign competition, obstacles generated by external environment (mainly, political issues that prevent organizational learning and foreign trade).

At the same time, it should be noted that current position and development level of the OJSC “SASTA” is largely better than indicators of national machine-tool producers, mainly thanks to right direction of innovative activity and attempts to set and maintain export relationships. According to (Maeva & Zvonova 2011; Gurunyan 2015), majority of Russian enterprises either do not conduct innovative activity at all or just copy new products or improvements from abroad. Regarding international activity, such companies even do not plan it in the middle-term perspective.

The stages of the case company’s NPD process are similar to those of the Stage-Gate model that is typical for industrial product innovations of similar to machine-tools scale and complexity. The difference from original framework is the absence of prescribed official “gates” at the end of each stage. Yet, it is reasonable since usually at a definite period of time OJSC “SASTA” executes the development of one-two, not several innovative projects, that is a feature of all industrial innovations with long complex development cycles.

Particular issues occurred during commercialization of several company’s innovations as well as their reasons are also typical and were anticipated basing on the results of theoretical and mainly industrial statistic materials review. In particular, mentioned in the Section 3.2 customer dissatisfaction and complaints about the whole line of innovative products can be fairly considered the consequence of significant lack of customer orientation, improper or absent market testing procedures during the NPD process, that are the responsibilities of company’s marketing function. This testifies the study of Nagorny (2013), where the scholar concludes that

absence of relevant customer analysis and interaction almost always fell behind new products' failures. Another reason for such an issue is the fact that marketing specialists usually get involved in the NPD process late, when the product concept is already designed and approved, and are required just to elaborate marketing strategy for the product as it is. This proves the conclusion of R.G. Cooper (2012) about multidimensional project teams from the very beginning of the NPD process as one of the main conditions of an innovations success.

Revealed shortages in marketing strategy are fairly common and were mentioned in previous studies. In particular, issues with customer interaction and orientation, e.g. communicative strategy drawbacks were earlier found out both at national (Minin 2007) and foreign (Cooper 2012) enterprises.

The second case of the company's being overperformed by competitor's pricing strategy also lies within the conclusions of previous studies about the necessity of external environment analysis in front of the NPD process (Nagorny 2013; Cooper 2012). Given their presence and quality the company could be aware of competitors' intensions and take counteractive measures.

5.2 Theoretical and managerial contribution

The study contributes to existing theories of industrial innovations development process, marketing planning for industrial products as well as to earlier studies of innovative activity of Russian B2B producers. In the author's opinion, the most significant is the investigation of correspondence of modern basic approaches to the NPD process and summarizing of its advantages and shortages for national-machine tool industry. The results can be also generalized to other country's industries where new products have similar characteristics as well as to countries with immature national innovation systems, such as, for example Brazil, Mexico or India (Chaminade & Perez 2014). Such studies that was not performed in considered paper of national scientists, even those entirely devoted to the development of industrial innovations in Russia (Dubrovsky & Ivanova 2017; Dorofeeva 2011).

However, from the author's perspective, the study has much greater practical significance. Firstly, empirical research results highlight the most problematic aspects of studied phenomena, thus, highlight the points that require peculiar attention. This holds value for other similar companies. Secondly, on the example of concrete enterprise and industry it is practically presented how the NPD process can be adapted to a company's specifics, that is especially of use for innovative project managers. The paper is also helpful for marketing specialists, since there are presented and ordered all the necessary during the NPD process types of marketing analysis.

Finally, certain practices of the OJSC “SASTA” can be considered development aims for many national enterprises. To such refer:

- Broad product portfolio.
- Production of semi- and fully customized machine tools.
- Provision of customer learning and education services.
- Creation of own innovations (not copying of foreign products).
- Cooperation with state research institutions, presence of own R&D center, organizational learning from foreign partners.
- Selling of products to foreign customers.

5.3 Delimitation and reliability

The study focused on the process of development and marketing planning for Russian machine-tool industry innovative products, and in fact, was aimed to extend the features and problems of the phenomena to innovative companies in other national industrial sectors where new products have similar features in terms of technological complexity and length of development cycle. The limitation of studies with one industry and one country was a conscious choice done by the author, conditioned by the acute problems in the given sphere, previous experience and interest of the author in the research environment.

Further, the research is limited by investigation of one case company that is mainly explained by availability of necessary information and sampling criteria. From several companies, initially considered appropriate for making a survey only the representatives of the OJSC “SASTA” agreed to discuss relevant for the thesis issues.

Finally, only the effects of marketing planning and models of the NPD process on industrial innovations’ market success and competitiveness were investigated. At the same time, market performance has other constituents such as mana

The case study approach, selective sampling and data availability posed several possibilities for research biases and errors. First, even in spite of and confirmation of them by the outcomes of the given empirical research, certain concrete problems may be present or, on the contrary, absent in the case company, thus, research findings and recommendations cannot be fully expanded and applied to other machine-tool producers.

The extension of the research to other national B2B industries requires is compromised by possible variations in innovative activity conditions (share of state support, infrastructure, political influence, etc.) to positive or negative side and peculiarities of other innovative products and the processes of their development.

Another reliability-decreasing factor is the company's employees' impossibility to reveal much precise, especially numerical information. This is rationally explained by corporate information protection policies prescribed by Russian law (Pravo 2018) and business ethics. Additionally, the interlocutors could distort certain provided data in order to make a better look of the company for the researcher and future readers of the given paper.

5.4 Suggestions for further study

One category of suggestions for further studies is generated by moving the research scope to other B2B industries, countries and research subjects. In the first case existing NPD models and marketing planning can be investigated within industries with similar products, for example, medical equipment, shipbuilding or industrial transport construction, or industries implicating significant product differences, such as, for example, production of fertilizers. This can be a kind of additional study with similar structure aimed to test validity and universality of the research results and their generalization possibilities.

Secondly, there is the sense of directing the study to machine-tool industries of other countries with not yet well-developed innovative infrastructures such as Brazil, Mexico, India.

Regarding the shift in research subjects, new studies can examine the influence of qualification, motivation and experience of workforce, managerial style and corporate culture on performance of industrial innovations.

The second category of further research directions are driven by revealed by the given study national industrial enterprises' problems related neither to the NPD process, not to marketing planning. Thus, in the author's opinion, a study of national B2B customers' motivations for cooperation with producers and providing recommendations on the ways of their increasing would be highly appreciated by industrial companies. The same subject could be also investigated in relation to national distributors, that is explained by their preferences for foreign producers and attempts to influence and control national partners.

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Appendix 1.

Topics and questions for interviews

Section 1. General questions.

1. Describe your current market position.
2. Does the corporate strategy implicate its change in the short-term?
3. Who are its main customers (target audience)?
4. Is there high competition in the company's market segment? Who are the main competitors?
5. Does the company already sell its products abroad or intend foreign market entry?

Section 2. Innovations and NPD process

1. What are the main drivers for innovations development?
2. How do you assess the company's R&D function? (Do you consider it efficient, developed, etc.).
3. How often does the company generally implement innovations in the market?
4. Does the company use certain framework for NDP process? (Or: On what stages can the company's NPD process be conditionally divided?).
5. How do you select ideas for potential new products? (Additional: Do they generally based on available technology, needs and wants of customers or market trends?) What criteria are applied? What departments are involved in the selection process?
6. How do you assess market potential of the chosen idea? (Does it involve customer survey? Were there any cases when you had to make changes in the project basing on the results of the assessment?
7. As the product description is ready, do you interact with customers prior the actual process of development to find out their possible suggestions?
8. What departments (functions) are involved in the development process? How do they interact with each other?
9. Have you ever had to make changes in the scope of the project already during development process?
10. Do you perform testing of new product? How is it done?

Section 3. Commercialization process

1. At what stage of innovation development process does the company prepare marketing plan for the new product? What aspects does this plan consider?
2. What risks does the company seek to minimize by making the plan?
3. What kinds of activities are performed during product launch? What is the general order/schedule of them?
4. What aspects are the most difficult during commercialization process?

5. What does “successful commercialization” mean for the company? Are there any metrics for it? When does the company generally start drawing the line of an innovation’s commercialization?
6. Were there case(s) then new products did not succeed in the market? What were the main reasons for it? What conclusions were made and what measures were taken in order to avoid such situations in the future?

Section 4. market orientation and marketing planning

1. How often does the company conduct market research? What aspects does it concern?
2. Does the company cooperate with customers in order to learn their preferences, understand what products or services they may need in the future?
3. Does the company create separate marketing plan for each new products or it makes changes to existing marketing plan for certain segment?
4. On what term are marketing plans generally developed?
5. What elements does the company’s marketing plan include? (Additional questions regarding marketing mix).

- Product strategy: Are there stipulated product modifications tailored to customer needs (customization?) Does the company offer services in addition to the product (installation, technical support, training, etc.?).
- Pricing strategy: On what basis are the prices for the company's products defined? What pricing strategy do you follow (promotional, commodity, value, premium or skimming)?
- Distribution strategy: Does the company distribute its products independently or through intermediaries? How are they selected? Have you ever had problems in dealing with them?
- Communication strategy: Does the company participate in industry exhibitions and trade fairs? How can you characterize relations with core clients? Is the company represented in professional social networks? What digital communication channels do you use? What information can a potential consumer receive on the company's website? (how informative do you consider it?).