The concept of hacking growth and technological breakthrough of Russian agricultural machinery industry with the use of engineering marketing approach

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Abstract. The article is dedicated to the consideration of hacking growth theory in the context of technological breakthrough of Russian agricultural machinery industry with the use of engineering marketing approach. Taking into account the results of analysis of Russian agricultural machinery dynamics in recent years, the prospects and opportunities for overcoming current problems (in particular, insufficient competitiveness and technological gap) are discussed on the basis of investigation of existing approaches to technology business development. The solution is suggested which consists in creating interdisciplinary growth teams capable of developing and implementing relevant innovative solutions, as well as providing rapid spread of changes. The issues of internal transformation necessary for the adjustment of Russian enterprises to the changing external environment in the context of knowledge-based economy development are considered in the paper.

1. Introduction
As is commonly known, the agricultural machinery industry is one of the key segments of the entire machine-building complex in Russia, its share in the production of machinery and equipment is more than 18%. In recent years, this machine-building industry has faced several problems, the influence of which increases in current unstable economic environment complicated by the impact of the epidemiological crisis. The agricultural engineering industry of Russia is characterized by such trends as:

- technological gap with the leading countries in the industry;
- high share of imports in the market (over 40%);
- high dependence on government support, including subsidies;
- low effective demand in the domestic market;
- undeveloped export distribution channels [1].

Soon the reduction of foreign equipment supply is possible due to the ruble’s decline and temporary shutdown of production in other countries because of the coronavirus spread. Russian manufacturers can take advantage of this situation to expand the domestic sales market, but this requires overcoming some current challenges. It seems that one of the most effective strategies in the current environment can be a technology breakthrough strategy.
From our point of view, engineering marketing in the implementation of technological breakthrough is an experimental and evolutionary form of marketing in engineering activity that was developed in response to the conditions of rapidly evolving economic environment. The task of technological breakthrough is to accelerate the iterative growth process as part of the evolutionary development using engineering marketing. A technological breakthrough is a cycle of fast evolution based on the convergence of technical, economic, informational, social and other sciences. Engineering marketing can become one of the drivers of technological breakthrough that enables the use of enterprise’s potential to address consumer concerns employing modern information systems, technologies and engineering software.

2. Results
It is important to note that the analysis of the dynamics demonstrated by the Russian agricultural machinery industry in recent years shows that after the observed production decline in 2013-2015 and subsequent growth of the industry in 2016-2017 the quantity of produced agricultural machinery decreased again in 2018-2019 [2]. In the conditions of ruble depreciation, the prices of foreign-made tractors will significantly increase. Considering that by 2019 the share of imports in the tractor market is 76%, the current situation can become a growth driver for Russian enterprises, which will be able to replace a significant part of imported machinery. However, the development of this sector to a large extent requires the implementation of innovative solutions to raise product competitiveness.

Exploring the ideas of Sean Ellis and Morgan Brown [3] we were attracted by the theory of hacking growth that is currently studied by many foreign and Russian researchers. It seems that the term “hacking” proposed by Sean Ellis has a broader meaning than “explosive, breakthrough”, since it is used in different variations: “hackathon”, as a forum for software developers, “hackspace”, as a workspace where people with common interests, such as computers, technology, digital art can meet and collaborate, etc. According to Ellis, the most important characteristic of “hacking growth” is the process of team creative brainstorming along with the search for pressing problems and their solutions.

From the perspective of engineering marketing, the concept of hacking or disruptive growth is associated with the processes of creating and commercializing innovative products at all stages of engineering activities, including research and development, preproduction engineering, organization of production and support service. This activity provides for broad participation of the entire engineering staff of the company - from research engineers, designers, technologists, to partners and other engineers, suppliers of materials and component parts, developers of engineering software and innovative information technologies and systems, mathematicians, possibly even competitors with the respective level of openness and communication. In doing so, the important resource for technology business efficiency increase in the agricultural engineering industry should be the use, of engineering marketing tools in their evolutionary advancement, which the authors considered in their research [4], taking into account the increase of its conversion with the objective of shifting of enterprises to manufacturing of brand new products.

In our judgement, both hacking growth and technological breakthrough should involve not only a one-time effort or change, but continuous improvement, the search for ideas, problems and strategies to increase the efficiency and competitiveness of business. Under these conditions, there is a constant need for development and implementation of disruptive and fast innovations at all stages of engineering activity, which can lead to rapid success [5]. In this case, achievement of goals is determined by everyday generation of disruptive innovative engineering solutions with constant experimentation and testing of a large number of suggested solutions using information technologies and systems, as well as engineering software. It is important to emphasize that hacking growth is a team approach that can be easily adapted to the specific needs of almost any company of different size and industry (small, medium, or large enough). The authors suggest creating interdisciplinary teams to develop competitive advantages of enterprises. Such interdisciplinary growth teams, we believe, should include engineers and technicians specializing in performing various functions at all stages of engineering activities, namely: researchers, designers, technologists, maintenance engineers,
programmers, analysts, mathematicians and other employees with additional market competencies [6]. In addition, they may include marketers with logical, creative, constructive and emotional thinking. In this respect, it seems to us that the employees of the company need to acquire additional competencies in the field of such courses as “Engineering Economy”, “Engineering Marketing”, “Network Science”, “Network Communications”, etc. [7]

It is known that even the largest companies like, for example, IBM see the hacking growth as the most important tool for competitiveness improvement. At present enterprises can almost instantly monitor consumer reactions to offers, motivate them and change their priorities, improve product design and development processes in real time, applying “smart” technologies, appropriate equipment and engineering software.

Creating interdisciplinary teams for Russian manufacturers of agricultural machinery it is necessary to apply a fundamentally new approach based on the engineering marketing that involves the symbiosis of scientific knowledge of engineers of various technical specialties. The key feature of this approach consists in the marketing ideology that provides for a rethinking of technology entrepreneurship, taking into account the integration of technical, economic, mathematical, physical, natural, psychological and other sciences in order to form a new market mindset and way of action of engineering staff and management. It is also worth mentioning that current studies are aimed at achieving important discoveries in such categories as “mind” and “thought”, in the course of implementation of which the valid answers in the field of brain function research can be obtained on the basis of convergence of many sciences [8]. This approach will lead and is already leading to the development of new technologies (for example, in the field of neurophysiology, genetic engineering), for which mathematical methods and technical means are important, including the interaction of elements “interface - brain – computer” and the ability to control various equipment “by the power of thought”.

In this regard, it should be noted that in Rostov-on-Don “smart” agricultural equipment is being developed: the first unmanned forage harvester F 265O was produced, which is capable not only of executing a given program, but also using computer vision to change it depending on the circumstances. The harvester is also equipped with sensors which respond to all obstacles. Besides, as it became known, a contract was signed between the governor of the Rostov region V.Y. Golubev and President, Chairman of the Board of Sberbank of Russia G.O. Gref to develop smart digital technologies in industry and social sector. In July 2020, the Chairman of the Government of the Russian Federation M.V. Mishustin held a meeting in Kazan on the development of the IT industry, where the tremendous work done by local specialists in this direction was noted. The first in Europe unmanned, already operating taxi and unmanned cargo vehicle KamAZ were demonstrated at this meeting. The high level of Russian developments in the field of IT and digital industry security was also noted. In the short run, it is planned to develop state support of the IT sector: for instance, it is intended to allocate about 250 million rubles for grants in the IT sector, to reduce the income tax for individual entrepreneurs, etc. The options of expanding state support for the agricultural machinery sector are also being considered, including preferential leasing, subsidies and compensation of discounts [9].

We would like to draw attention to the aspect that developing the engineering marketing concept, we use, among other things, the arguments of Lauren Graham presented in the work “Lonely Ideas: Can Russia compete?” [10]. The innovative technological achievements of Russian scientists make sure that Russian enterprises will be able to achieve and maintain high level of competitiveness by means of development of technology business, entrepreneurial spirit and creativity.

Engineering marketing is susceptible to all new things, which is especially manifested in the organization of modern production and development of customer-oriented innovations with the use, for example, of QRM system (Quick Response Manufacturing) that is based on engineering solutions allowing saving time [11]. This approach aims to ensure a variety of product range and expand the scale by increasing the number of customers ordering the same product or service. Thus, a fundamentally new production system is formed that is focused on meeting customized demands of
clients, operating according to the nature of present and future production needs. The difference between QRM and other systems lies in its openness and original tools, for example, “time maps”, which increase visibility of complicated stages of production process duration reduction. Furthermore, the use of QRM system makes it possible to take the mindset of all employees of the interdisciplinary group to a new level, that will help to get the status of socially-oriented enterprise functioning in a rapidly changing market environment. The general framework of enterprise hacking growth based on engineering marketing use is shown in Figure 1.

**Figure 1.** General framework of enterprise hacking growth based on engineering marketing use (original development based on the research findings).

According to the hacking growth theory, interdisciplinary growth teams should pay attention to the problems of improving performance in terms of motivating consumers to communicate with the manufacturer, as well as conducting appropriate testing and experiments for this purpose (Figure 1). With that in mind, we find interesting the approach of S. Ellis and M. Brown to the use of so-called “triggers”, tools that cause one or another reaction of consumer to the actions of manufacturer. In this case, the efficiency of triggers is determined, on the one hand, by consumer’s motivation, and on the other, by convenience of triggers’ use. From this perspective, the practical model of B.J. Fogg [12], the psychologist from Stanford, can be used to determine the factors influencing consumer motivation and increase the efficiency of triggers’ use.

In our opinion, the growth teams of Russian agricultural machinery manufacturers may use a similar approach at various stages of engineering activities to improve the loyalty of consumers (applying the triggers shown in Figure 1). For instance, customer loyalty can be improved by:

- increasing the speed of large order delivery using advanced digital technologies and “smart” logistics;
- reducing the costs of agricultural equipment service as a result of introduction of innovative engineering solutions based on engineering software and IoT platforms, which reduce the time required for equipment repair;
- introducing solutions for product improvement based on strategic capabilities of consumers, etc.
3. Discussion
It is commonly known that the surest path to business success includes endless and constant search for available opportunities. Winston Churchill said that a pessimist sees difficulties in every opportunity, and an optimist sees opportunities in every difficulty [13]. Einstein wrote that in the disorder we should look for simplicity, from discord we should find harmony and in difficulty there is an opportunity [14]. To find and use opportunities each company needs to develop and implement its own hacking growth strategy. The development of this strategy is possible both in business in general and in the technology business, in particular.

If we are considering the business as a whole, then we agree with Sean Ellis and Morgan Brown that the hacking growth strategy and its methodology should be built by “cross-functional” growth teams consisted from representatives of company’s various functional departments, capable of collaborative mainstreaming of ideas (Figure 2).

![Figure 2](image)

**Figure 2.** The role of marketing in the process of product development by cross-functional teams (according to the concept of S. Ellis and M. Brown).

From this perspective, in our judgement, marketing should play coordinating and integrating role for the entire team operation so that all enterprise departments could act in an integrated manner for effective hacking growth of business as a whole (Figure 3).

![Figure 3](image)

**Figure 3.** The role of interdisciplinary growth teams with additional marketing skills as a basis of hacking growth (original development based on the research findings).

The purchase funnel suggested by S. Ellis and M. Brown with a typical allocation of responsibilities for cross-functional growth teams is presented in Figure 4.
Figure 4. The purchase funnel with a typical allocation of responsibilities for cross-functional growth teams (according to the concept of S. Ellis and M. Brown).

Figure 4 shows that all the efforts of marketers are aimed only at the top of company activity, that is, at ensuring consumer awareness, branding, advertising, digital marketing, but not at developing and improving products, production process, quality, logistics. We believe that marketing, in fact, needs to be viewed from a holistic point of view. Holism (from Greek holos - "whole") is a philosophical doctrine that considers the problem of the relationship between a part and a whole. The basic principle of holistic approach is that the whole is always something more than just the collection of its parts. Based on this, the essence of holistic marketing is to ensure the marketing orientation of work of all company’s functional departments. This approach is consistent with the opinion of Peter Drucker that marketing is so basic according to its nature that it cannot be considered as one of business functions along with other functions. He says that marketing encompasses the entire business viewed from the perspective of the consumer [15]. Consequently, the marketing departments of the enterprise should play an integrating role in interaction with other departments. In this regard, we do not quite share the opinion of S. Ellis and M. Brown on the issue of differentiating the processes of product creation and marketing. It seems to us that the process of creating a product should be based on marketing and ensure focus on meeting market needs.

Considering that growth can be stimulated both by creating a new product and by significantly improving an existing one, we would like to emphasize that close cooperation between marketing department and production departments of industrial enterprises is quite rarely observed, since engineers usually prefer to act according to their technological mindset.

Unlike S. Ellis and M. Brown, we consider hacking growth strategy implementation not in business in general, but in technology business, including production of agricultural machinery (Figure 5).

Figure 5. The purchase funnel with a typical allocation of responsibilities for interdisciplinary growth teams.(original development based on the research findings).
As can be seen from Figure 5, in our opinion, the development and implementation of hacking growth strategy of an enterprise should be carried out by interdisciplinary growth teams, considered in this paper and consisted from both engineers and marketers capable of developing innovative technical and technological solutions focused on meeting the needs of the target audience on the basis of application of advanced “smart” technologies and equipment.

4. Conclusions
In conclusion, it should be mentioned that the most important threat to the long-term success of any enterprise is insufficiently fast and flexible response to changes of market environment, as a result of which growth can slow down. Best practices from abroad show that this phenomenon arrives unexpectedly and can be expressed in different ways, including shortcomings of strategic vision of agricultural machinery development, lack of ongoing scientific research, imperfect management structure and organization of production, insufficient training of staff, corporate culture problems, as well as business strategy and tactics mistakes [16]. One way or another, growth slowdown demonstrates insufficient use of enterprise potential. Hacking growth theory that assumes endless movement and search for new ideas, also includes the philosophy of continuous rapid forward movement. We share the opinion of S. Ellis and M. Brown that growth slows down when it is no longer a priority. In this respect, it is important for interdisciplinary growth teams to monitor growth parameters, analyze the causes, problems and pitfalls that lead to failure, and return to testing and experiments which accelerate the expected result. Growth teams should also look for new channels to stimulate growth, choosing the solutions which work faster and better, while avoiding growth slowdown. The main challenge of hacking growth is to ensure virality, that is, the rapid spread of suggested changes and confidence in the real value of the new or enhanced product for the consumer. The term “viral” is related to a virus and means something that is rapidly spreading. Thus, the concept of hacking growth includes not only a business strategy and continuous growth, but also a philosophy of change that will allow Russian agricultural machinery manufacturers to organize the work of interdisciplinary growth teams based on engineering marketing and thereby to take business to the next level of competitiveness.

References
[1] Komarov V, Pronchenko L and Litvina N 2020 Agriculture machinery industry as fundament of agriculture in Russia, Alma mater. Vestnik Vysshey Shkoly, 70-74 doi: 10.20339/AM.03-20.070
[2] Kuzmin V and Goryacheva A 2018 Export of Russian agricultural machinery: is it high time or too soon for it? Vestnik of Moscow Goryachkin State Agroengineering University, 5, 51-56 doi: 10.26897/1728-7936-2018-5-51-56
[3] Ellis S and Brown M 2017 Hacking Growth: How Today’s Fastest-Growing Companies Drive Breakout Success (London: Ebury-Publishing) p 320
[4] Lubanova T and Zozulya D 2012 Engineering Marketing as a Tool to Increase the Efficiency of Industrial Enterprises’ Development (Saarbrücken: LAP LAMBERT) p 176
[5] Mallett O 2019 Collaboration in entrepreneurship education: challenges, opportunities and innovations, Journal of Small Business & Entrepreneurship, 1-6 doi: 10.1080/08276331.2018.1541681
[6] Florida R 2014 The Rise of the Creative Class--Revisited: Revised and Expanded (New York: Basic Books) p 512
[7] Sanidas E 2018 The Role of Knowledge in Determining Innovations, Technology, Business, Management and Economic Development: An Expansion Beyond Knowledge, International Journal of Economics & Management Sciences, 07(01) doi: 10.4172/2162-6359.1000501
[8] Donnelly L. 2020 The brain: functional divisions, Anaesthesia & Intensive Care Medicine, 21 doi: 10.1016/j.mpai.2020.03.004
[9] Borisov A and Danilova S 2020 Current Russian agricultural development trends, IOP
Conference Series Earth and Environmental Science, 548 doi: 10.1088/1755-1315/548/2/022031

[10] Graham L 2013 *Lonely Ideas: Can Russia Compete?* (Cambridge: The MIT Press) p 216

[11] Suri R 2016 *Quick Response Manufacturing: A Companywide Approach to Reducing Lead Times* (Aldershot: Gower Technical) p 576

[12] Fogg B J 2019 *Tiny Habits: The Small Changes That Change Everything* (Boston: Houghton Mifflin Harcourt) p 320

[13] Gilbert M 2012 *Churchill: The Power of Words: His Remarkable Life Recounted Through His Writings and Speeches* (Cambridge: Da Capo Press) p 536

[14] Einstein A 2011 *The Theory of Relativity: And Other Essays* (New York: Philosophical Library/Open Road) p 106

[15] Drucker P F 2011 *Management Challenges for the 21st Century* (New York: Harper Business) p 224

[16] Shimasaki C 2020 *Company Growth Stages and the Value of Corporate Culture*, Chapter in *Biotechnology Entrepreneurship* (Cambridge: Academic Press) p 527-540 doi: 10.1016/B978-0-12-815585-1.00035-8.