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Overview and Classification of Methods for Accelerating the Process of Developing and Introducing New Products

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ABSTRACT

A key element of the knowledge-based economy is the speed of the innovation process. The shortening of the time for development and introduction of new products is becoming a major source of competitive advantage. Companies that first come to market with new products may establish higher initial prices, to gain dominant market share, to gain customer loyalty, gain the most attractive distribution channels, to create an image of technological leadership and to increase its credibility among consumers.

There is a vast array of methods and techniques to accelerate the development of new products that are discussed in the scientific literature. The purpose of this study is on the base of analyzing, summarizing and systematizing of the accumulated theoretical and empirical research in the field to group and classify the methods, whereby the methods of similarity to be integrated into a group that constitutes the content of an approach. The article proposes 10 main approaches as well as methods/mechanisms for their realization. The article discusses conditions under which the implementation of the approaches is effective, as well as gives recommendations about which approach is most appropriate to be used at different stages of development and implementation of a new product.

Keywords: accelerating new product development, concurrent engineering, licensing, VE/VA (value engineering/value analysis), standardization, group technologies, cross-functional teams, information technologies, reengineering.

INTRODUCTION

The increasing of competition and the shortening of the life cycle of products in a constantly accelerating scientific and technical progress turn the reduction of time for the development and the introduction of new products in major source of competitive advantage. Companies that first come to market with new products may establish higher initial prices to gain dominant market share, gain customer loyalty, gain the most attractive distribution channels, as well as to create an image of technological leadership and increase its credibility among consumers. That is why the study of approaches to shorten the innovation cycle is extremely important. This problem is widely discussed in the scientific literature [1-20].

EXPLANATION

The cycle of development and introduction of new product generally has to be split in two parts:

Time for product development, including all

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stages of the innovation process from idea generation to the creation of a prototype and conduct of the trial run;

Time for implementation of the product, which covers the stages of manufacturing of the product and its introduction to the market.

The separation of these two parts is appropriate since implementation usually requires more resources and development - more time.

The analysis and summarization of the theoretical and empirical research in this area enables us to highlight some basic approaches to accelerate the development and introduction of new products that can be realized through specific mechanisms (Table 1).

Use of systematic methods for generating ideas for new products - analytical and non-analytical

The analytical methods are on the base of the application of logical thinking in the frames of formal structured information. These methods aim to find new approaches to problems or new combinations through systematic search. This is possible thanks to the orderliness of the world around us. If once are established fundamental relationships linking what previously was seen as a coincidence, these same relationships can be applied to new objects and processes, and to make new discoveries. Most known analytical methods are the following: morphological analysis, value engineering/value analysis, the analysis of the needs, the methods of control issues and the likelihood [22 - 23].

Non-analytical methods stimulate visual thinking in unorthodox direction in order to free the mind from the constraints imposed by logical thinking. They stimulate the imagination to look in a new way the problem. The application of such methods, though still not received very widespread, is very promising. Non-analytical methods are brainstorming, the method of focus objects, and methods for the eradication of deadlocks, synaptic method, heuristic programming, and many others. Of these, the most widely used is the brainstorming. This is due to its ability to generate the maximum amount of ideas in a short time, and that is relatively easy to use [24 - 25].

Elimination of steps or stages

The old and widespread mechanism for the implementation of this approach is the purchase of licenses and takeover of companies developing something new. This allows the reduction of the many stages of R&D, and accordingly - the cost. According to the studies of E. Mansfield developing a new product based on the license allows 30 % of shortening of its development and by 35 % - the cost [26].

The adaptation of external inventions is the main source of innovation worldwide. This mechanism is highly effective, however, if the license has been purchased at the beginning of the product life cycle and if there was a swift and successful absorption. Besides the degree of novelty of the license, other important factors are the following: compatibility of traditional production company with license; availability of personnel with appropriate qualifications and experience for successful implementation of production license; the price of the license; the duration and methods of payment, etc. Thanks to the massive purchase of licenses from the US in the period immediately after World War II and the next three decades and the rapid and successful mastering the Japanese were able to unleash a series of high-efficiency production, managed to quickly overcome postwar ruin and not only reached but also in a number of industries surpassed USA. Recently, however, the developed countries held a protectionist policy not to sell licenses for their latest products and technologies and therefore the purchase of a license could lead to a copying already long known solutions and weakening of the company in the competitive struggle.

Other mechanisms to eliminate steps are the application of value engineering/value analysis (VE/VA), standardization and the use of group technology [1, 2]. Value engineering and value analysis mean a redesign of the product based

Table 1. Approaches and mechanisms for accelerating the development and introduction of new products.

Approaches to reduce the time for developing and introducing new products	Mechanisms for implementation of the approaches
1. Use of systematic methods to generate ideas for new products	- Use of analytical methods; - Use of non-analytical methods.
2. Elimination of steps or stages	- Purchase of licenses and takeover of companies developing something new; - Value engineering and value analysis; - Standardization; - Using of group technology.
3. Removal of delays	- Use of supply of type "just in time"; - Cross-functional integration.
4. Parallel realization of processes	- Concurrent engineering; - DFM (Design for Manufacturability).
5. Use of modern information technologies	- CAD (Computer-added design); - CAM (computer-added manufacturing); - ERP (Enterprise resource planning system); - Internet and Intranet; -e-commerce.
6. Use of cross-functional teams	- Use of collocated teams; - Use of virtual teams; - Using global teams.
7. Increasing of resources	- Include more people in the project.
8. Open innovation	- Purchase of patents and licenses; - Supply of components, subassemblies and components from other companies; - Industrial cooperation; - Joint ventures; - Strategic alliances; - Involvement of consumers in new product development
9. Business process re-engineering	- Re-designing of business processes.
10. Creation of innovation climate in the company	- Encouraging informal communication; - Formation of a procedure for collecting ideas and evaluating them; - Create project groups with considerable autonomy and a small numbers of participants; - Promoting competition between projects; - Building a network to support innovation; - Stimulating initiative and creativity; - Create small groups activities (SGA); - Tolerating failure.

on a systematic study to establish how can be modified construction or materials to enhance the quality of the product and/or reduce production costs. It offers opportunities for simplification of the product or process through detailed analysis of the sources of non-increase value components, steps or even entire processes. Early detection of sources of non-increase value materials can eliminate unnecessary processes at later stages.

Standardization means using standard procedures, materials, parts and processes for the design and manufacturing of the product and thus accelerates the development and deployment. Group technologies are applying to products that have similar design features or manufacturing features to simplify design and manufacturing. They have the same effect as the accelerating by standardization.

Removal of delays

It may arise due to downtime, the presence of bottlenecks in production processes and other reasons. The lack of raw materials often causes downtimes. Effective mechanism for the elimination of downtimes is the use of the "just in time" supply system. Through its raw materials, materials, components, parts are delivering in exactly the right time. This system was for the first time developed and implemented by the car manufacturing company "Toyota". Its use by other Japanese companies began after the oil crisis in 1973 and the structural crisis of 1974-1975. Soon after that, its adoption started abroad, especially in the US. In USA quickly came the understanding of the great importance of the system. In addition to the cost reduction and the storage space, it provides continuity of the production process and reduces its continuation. This mechanism is effective but only when subcontractors are located at short distance from the company producing the final production and there is a high level of trust between them.

Delays may occur due to insufficient coordination between different activities in the innovation process. In [3], based on empirical research involving 65 American and Scandinavian high-tech companies in the field of computer manufacturing, telecommunications, tool manufacturing, biotechnology and software the impact of cross-functional integration on shortening the cycle of development and introduction of new products is established. Schemes of cooperation between the three main functional areas - R&D, marketing and manufacturing - are the subject of detailed study in [4]. Het concluded that the need for cooperation between specific functional areas varies according to the stages of the innovation process and depends on the degree of novelty of the product. One fact is explaining this. Namely, that the degree of uncertainties varies between innovation projects and between the stages of a project, and therefore - the need for cooperation vary. Research shows that while the overall level of cooperation between the research, marketing and production division increased from early to late stages of the project, the level of cooperation between the pairs of functions follows different schemes. Cooperation between marketing and R&D is most of the early stages of the innovation process. Cooperation between marketing and production and between R&D and production usually increases at later stages. The high level of cooperation between marketing and manufacturing and between R&D and manufacturing at the later stages of the innovation process is typical for highly innovative projects. For the less innovative projects more important is the high level of cooperation between marketing and manufacturing and R&D and manufacturing at the early stages of the process, and between marketing and R&D – at the later stages.

Parallel realization of processes

The parallel implementation of processes significantly accelerates the research and development of the product since it two or more tasks are executing simultaneously. For realizing this approach are used two mechanisms: concurrent engineering and DFM (Design for Manufacturability). Concurrent engineering is the opposite

of the phased project planning introduced by NASA in the 60-s of XX century. In planning, the phased completion of each stage of the innovation process is subject to assessment by management of the company and only good results achieved at some stage passes to implement the next. This enables management to supervise the process and reduces the risk associated with developing new products, but increases the time for the realization of the idea. Concurrent engineering means achieving overlapping activities. For the first time it has been applied in companies like "Honda" and "Fuji Xerox". In the case of concurrent engineering, the simultaneous or nearly simultaneous execution of all stages is replacing the stages. A team formed of all specialists involved in the project is working together from the beginning to the end. Thus, different professionals can interact even at the early stages of development for making changes that increase product quality. The successful application of this approach requires the creation of flexible organizational forms with the prevalence of horizontal and informal connections. Concurrent engineering is applying in such companies as "General Motors", "Chrysler", "Ford", "Motorola", "Hewlett-Packard" and "Intel" [5, 6]. Handfield [6] found that the time to develop new products through concurrent engineering represents about 60 % of the time needed in case of gradual development.

DFM [5, 7] is a method that allows taking into account the possibilities for testing, assembly and manufacturing of the product even during the time of designing. It ensures consistency between the requirements of the design and manufacturing capabilities. DFM can minimize delays that may occur due to mismatch between the desired specifications of a part or component (as planned at the designing stage) and actual specifications (realized in the manufacturing process). Such delay is possible to avoid by estimating the opportunity of producing a plurality of different constructive embodiments of the device in a virtual way - for example, using a simulation model. The application of DFM requires cross-functional team consisting of designers, engineers, financiers, marketers and manufacturing personnel.

Use of modern information technologies

Modern information technologies contain huge reserves to accelerate all stages of the innovation process. They enable quick and easy access to the necessary information for rapid exchange of information – it accelerates and facilitates research. CAD (Computer-added design) accelerates the designing stage of a new product. It allows when a part of the structure of the device is under amendment to identify easier the parallel effects on other parts, as well as to connect quickly electronically the final specifications of parts or components. By using HTML (hypertext markup language), the process of developing new products could accelerate further. For example, global access platforms allow multiple engineers to make adjustments in the structure of the product on-line. For software designers in "Hewlett-Packard" the software products that are under development are available constantly via Intranet, which reduces the work carried out by solving the same problem. The use of Internet and Intranet accelerates and eases communication among team members and between departments in the company. It boils down to zero the time of walking between offices.

CAM (computer-added manufacturing) accelerates the innovation process when manufacturing the new product.

ERP (Enterprise System Resource Planning) is an integrated information system that covers all aspects of the organization - planning, finance, human resources, procurement, production, marketing and sales. It enables the use of a common database and functional tools to optimize the activities of reconciling work, which in turn shortens the development and marketing of new products, reduces costs and increases efficiency [8].

In recent years, the use of modern information technology is particularly important for the faster implementation of the product [5]. The

Internet companies can provide detailed information about their new products to a wide audience of users using multimedia such as text, graphics and sound; to maintain user feedback and its business partners; to conduct market research on consumer preferences. As e-commerce is gaining widespread dimensions the business access to a wider range of users breaks the barriers of time and distance - sales are around the clock and year-round with buyers from around the world. In some cases, it is even possible the delivering of the goods through the network as a physical commodity (for example CD, software, newspapers, magazines) become virtual and are loaded directly from the Internet. Diverse types of IT applications in product development and their potential impact on both product and service innovation are shown in [9].

The use of cross-functional teams

A number of reasons determine the increasing use of cross-functional teams in the R&D of new products, among which in the first place is the acceleration of the process [10]. Only after that are the reasons such as improving the quality of the new product, the better meet of the needs of consumers, the lowering of the production costs, etc. According to the same survey at present 97 % of the companies, use cross-functional teams including one-third of companies, which use them for 100 % of the time, but two-thirds of the companies use them for more than 75 % of the time. The use of cross-functional teams in developing new products could be company policy and not subject to a specific solution for each individual project [2, 11]. The three main factors for the successful operation of cross-functional teams are clear goals, leadership and cooperation [10].

In turn, cross-functional teams can be collocated, virtual and global [12]. Collocated teams consist of individuals who work together at the same place and are of the same nationality. The physical proximity of team members enhances the level of trust and the level of cooperation between them.

Virtual teams consist of individuals who have an average level of physical proximity and are of the same nationality. They can be located in different regions of their country or are on different floors in the same building. Thus, each team member can participate simultaneously in several different projects. The members of the virtual team communicate with each other on-line, using tools such as e-mail, voice-mail, on-line discussion forums and more. Each specialist can obtain sheet with detailed information about the project at any time via the Internet, use it and make improvements in the project. The use of virtual teams not only speeds up the project, but also provides an opportunity to develop many projects simultaneously with the limited resources of qualified professionals.

Global teams are both geographically dispersed and culturally diverse. They consist of people who are representatives of different national cultures, live, and work in different countries. Multinational teams have a high level of creativity; they generate more and better alternatives to solve the problem. They also communicate on-line and the deployment in different countries allows the working on the project continuously as the project realized as relay race. For example, Japanese engineers at the end of their working day can send the project for further development to engineers from Europe. They convey the results of the work to American engineers. This would allow many times to shorten the time of development of the new product. Meanwhile geographical dispersion and cultural differences in global teams create difficulty in managing them, make more difficult the communication, reduce the trust and cooperation and impede the conflict resolution. In spite of that, the trend in recent years is the increase of the use of global teams in developing new products.

Increasing of resources

The increase in resources is another possible approach to accelerate the development of new product. The involvement of more people in the project is increasing the amount of man-hours and

made possible its performance in less time. This is not a typical linear approach as the increasing complexity of the inclusion of additional resources can lead to increased bureaucracy and hinders the development of the innovation process. To prevent this it is necessary to keep open a communication means.

Open innovation

This approach is in high use nowadays. Henry Chesbrough promotes the term in 2003 [13]. Open innovation implies, that external partners perform part of the innovation processes [14]. It consists in the use of external sources of ideas, resources, and involvement of external actors in the process of new product development. The causes for this are many – increasing sophistication of «average» new product and cost for its development, the need to reduce the time for its development under the impact of increasing competition, the need for risk sharing, etc. This approach uses a variety of mechanisms that differ in the degree of involvement of external partners:

Many companies have shipped out individual components of its new product, avoiding thus the need to build unique subsystems. The production of personal computers uses this approach particularly often. Very few hardware manufacturers produce all parts of the article. Many parts of the equipment are standard built blocks, which are available in the mass market - for example processors. In this case, the interaction between companies is the most weak;

Industrial cooperation is possible to see as a mechanism for open innovation. In this case the partners, while retain separate as legal entities enter into relations characterized by continuous and sustainable coincidence of interests. The target of the partners can be the development of a new product, new technology, production and marketing of goods or rendering of services.

In accordance with the agreement for cooperation, the partners organize joint production where within the overall production program each participant specializes in the development of individual components or certain parts of the final product or production of a limited number of finished products. These subsequently are object of exchange in a way, according to which each partner receives the full nomenclature of goods. Marketing and sales is possible to execute jointly, or by use of the sale network of one of the participants. In addition to the acceleration of the creation of a new product, industrial cooperation leads to increased product quality and reduces the risk in case of failure. Here the interaction between partners is very close and is based on the signing of the agreement for industrial cooperation. Industrial cooperation is a highly effective mechanism for the implementation of the Open innovation, since it cooperates at all stages of the research, development and realization of new products.

Another mechanism for the implementation of Open innovation is the company's participation in clusters, strategic alliances and joint ventures. Clusters are geographic concentrations of interconnected companies, specialized suppliers and service providers, firms in related industries and associated institutions (e.g. universities, standards agencies, and trade associations) in particular fields that compete but also cooperate [27]. Clusters carry out two types of activities: provision of services (consulting, legal, conducting marketing activities, implementation of logistics and support, providing information services, etc.) and joint implementation of projects. Both activities help to accelerate new product development.

Joint venture is an independent legal entity, which is under a joint command and control of the partners. Usually the two companies have complementary skills and common purpose (new product development, new technology, and new market penetration). Major drawback of joint venture is in that the joint ownership and management create a risk of the arising of problems in the process of decision-making.

Studies conducted by the consulting firm "Mac Kinsey" shows that 70 % of businesses

created by American companies jointly with foreign companies for technology transfer have failed. Joint ventures can count on success only if there is a coincidence of the long-term goals and technical levels of both partners. Unlike mergers and acquisitions, which require only a temporary agreement, and then operates only one company in the case of the joint venture there is a need of continued close cooperation and mutual understanding between the partners. Differences in the size of the companies, their financial status and their technical capabilities can adversely affect the joint venture. Therefore, it is very important in advance to study the strengths and weaknesses of partners, when financial, engineering, manufacturing and marketing operations are implemented.

Strategic alliances, whose particular case are the joint ventures; pursue strategic objectives aimed at improving competitiveness by creating new product-market combinations and by covering the full chain of value creation. They can be different shapes - ranging from relatively distant contracts for joint projects to the creation of joint ventures. Strategic alliances for innovation are possible if there is a mutually shared interest. Joint innovation leads to synergistic effect of reducing of the costs of the implementation of the innovation and to shortening the time of commercialization of the invention [28, 29].

– Another mechanism for the implementation of this approach is the customer involvement in new product development. It is possible to talk about two forms of participation of clients in the development of the new products:

(1) Participation of customers as a source of information (CIS) - in this case the new product development (NPD) team collects information from clients and customers through marketing research methods, such as interviews, focus groups and other forms of market research [17]. Customers provide information about what they need or want for a new product. The given approach requires companies to submit the information from the customers to the NPD team in the process of development of the new products. The NPD team assumes responsibility for the implementation of information collected from clients so to create products that meet customer needs.

(2) Involvement of customers in the very development of the new product (CIC) [15, 16]. In this case, the customers involved in NPD develop new products together with the NPD internal experts. NPD becomes a collaborative process where clients work as partners with the NPD team. This approach requires customers often and closely to interact with NPD experts over a long period of time. They participate in joint problem solving with the NPD team and directly contribute to product design. Customers actually participate in decision-making, along with the team of NPD, for example, in creating of certain characteristics of the product, and in establishing priorities in the process of product development [18, 21]. In practice, CIC is offering the customers to become a significant part of the efforts in the process of the new product development.

CIS and CIC differ in several important points, namely [15]:

First, the role of customers in the CIS is passive. They share information only because of inquiry and research by companies. The content of the information that customers share depends on what the company sought in their research. In CIC, customers play an active role. Acting as assistants in the process of NPD, they can take the initiative to share information that they deem most appropriate [16].

Second, a different role for the company. In the CIS, the company manages the NPD, because it determines what to collect as an information. The company shares responsibility with customers only through the application of information, which came from customers in the process of the design of products. In CIC, the company acts as a partner and is committed to co-decision with customers.

Third, in the CIS interaction between customers and team NPD is discrete in the sense that

the communication with customers is limited. It means that the company seeks only to obtain certain information. Although the company can interact with customers more than once, the number of interactions is limited and any communication occurs for a limited period.

In CIC, however, the interaction with customers is a continuous process. This process takes place over an extended period of time during which customers communicate with NPD team constantly. In CIS, clients only provide information about what they need. While in CIC customers not only share information about their needs, but also solutions, how they can meet their needs [18, 19, 21].

Fourth, CIS and CIC faced various challenges in the process of NPD. The main challenge for the CIS is in the fact that it is possible not to get enough information from customers. Because the NPD team determines what type of customer information is collected and how to use the information, the NPD team dominant role may limit the use of creative potential customers.

CIC overcomes this challenge by providing to customers a more active role. But it introduces new challenges, namely:

- The large amount of detailed information from customers increases the difficulty of processing [20];

- The need for coordination of customers increases the complexity of managing NPD, which can lead to conflicts. The latter can potentially harm the effective use of customer information [16].

These challenges facing CIS and CIC may influence the degree to which they are able to translate customer inputs into successful new products.

Business processes re-engineering (BPR)

This is the modern method of management the radical change of the business processes through their redesign. The objective of the reengineering process is optimization by eliminating the operations and activities that do not add value, improvement of quality and productivity, shortening the production cycle and significant increase of efficiency [8, 30]. Reengineering allows the creation of better and more diverse products with fewer resources in minimal time. The speed, quality and efficiency are the main advantages of reengineering. The implementation of business process reengineering involves implementation of the following interrelated steps: definition of the objectives of the organization; building a model of the existing business processes; redesign the processes; Testing of the model and possible adjustments; implementation of pre-engineered processes; evaluation of the results. Business processes re-engineering (BPR) widely uses IT and ERP-systems.

The creation of innovation climate in the company

Particularly important for the acceleration of the development and introduction of new products is the creation of an innovative environment in the company, the creation of favorable organizational conditions and simplification of administrative procedures. Slow, heavy and cumbersome bureaucratic procedures in large organizations are the most important factor in slowing the innovation process. Due to its specificity, innovation activities should be relatively independent and isolated from processes in the company. For this purpose, to build project groups with considerable autonomy and a small numbers of members. In many large companies between designing groups is deliberately arranged in-house competition. It is an established practice in companies as IBM, "Procter & Gamble", "Johnson & Johnson" and others. There, in parallel with each major project informally developed several small projects, which in many cases proved to be more effective. In such companies there is a rich support network for innovation in particular - their systems purposefully prevent "leakage" of information and resources, enabling enthusiasts to work on "smuggling" projects. For example, "Hewlett-Packard" allows free access of employees to the warehouses of materials used in new developments, and 15 % of the working

hours of engineers and designers are for work on projects developed on their own initiative.

Leading corporations pay great attention to the project leader and provide all its support. Widely practiced is the entrepreneurial approach. Senior management should stimulate creativity and initiative, horizontal and informal ties, tolerate failure, and control the course of the innovation process to be relatively weak. Excessive control paralyzes creative initiative. Therefore, a fundamental requirement in innovation is to carry out controls only on the results. Team developing new products should enjoy a high degree of autonomy - the company must provide them financial, material and technical, information and more help, but not to interfere in their current activity. Even for a negative outcome, there should be no punishment for failure, because it would kill the desire for experimentation and risk-taking. It is also important to provide the senior management environment free from "protection of territory" and "intolerance funding" reaction.

In order to stimulate initiative many companies create small groups for improvement of activities (SGA-Small group activities). They consist of volunteers who stay overtime to discuss issues related to the company activities, to suggest ways of improving existing products, services, processes, etc. The first of these groups were created in Japan as early as the 60-s of the twentieth century - these are the quality control circles. Subsequently, this practice spread to the US and Europe. The effect of the creation of such groups is particularly large when parallel applies formal system for evaluating executive work in which one of the criteria is the number of proposals given by each contributor to the improvement of the activity.

Greg Satell in his book "Mapping Innovation" states four things that create an innovative culture in the enterprise [31]:

- Focus on problem solving;
- Safe spaces – a psychological safety, or the ability of each team member to be able to give voice to their ideas without fear of reprisal or rebuke;
- Developing of informal networks;
- Collaboration.

Jean Lammiman and Michel Syrett believe that the creation of innovative climate within the organization requires the following conditions [32, 33]:

- Changes in the style of the performance of current tasks, allowing work at home and at leisure at the request of the individual;

- Dealing with the "culture of excuse", which involves observing the rules instead of taking risks;

- Promote atmosphere of "everything is possible", especially during creative discussions, because the quantity of ideas, not their quality, lead to revolutionary discoveries;

- Encouraging people to draw inspiration from their own world and the world out of business because it is the ability to link the seemingly non-related stuff or the ability of address problems in business from a different perspective, which lead to creative solutions;

- Allocation of the necessary time, power and "space" to do all this;

- Conversion of the act of adoption and foster the ideas of subordinates and colleagues in basic management technique.

CONCLUSIONS

There are a variety of approaches and mechanisms for shortening the time for research and development of new products. At the various stages of the innovation process, there are different approaches and mechanisms for its acceleration. For example, the quick generation of a large number of new ideas means appropriate use: Of nominal group techniques such as brainstorming; Permanent study of market needs; The inclusion of all employees in the company in the creative process of generating ideas through the creation of small groups activities, the stimulation of competition between them; The formation of a procedure for collecting ideas and evaluating them.

The use of modern information technologies creates opportunities for shortening the time for carrying out research and development. The application of concurrent engineering, value engineering and value analysis, cross-functional, virtual and global teams can accelerate the designing. At the production stage utmost importance to accelerate the process have the manufacturing automation, standardization and the use of group technology, as well as the use of the "just in time" system, etc.

Aggressive marketing strategy, conducting of large-scale advertising campaign, staff training and motivating to sell the new product, organizing after-sales service and e-commerce is also very important for the rapid commercialization of the product. Some approaches are applicable at all stages of new product development - these are, for example, increased resources, open innovation, the use of ICT.

Each of those approaches has its importance, but only the complex use may lead to the achievement of synergies and the maximum accelerating of the research and development of the new products.

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