

NEW PRODUCT DEVELOPMENT (NPD) PROCESS – AN EXAMPLE OF INDUSTRIAL SECTOR

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Abstract:

This aim of this article is to present the process of new product introduction on example of industrial sector in context of new product development (NPD) concept. In the article, the concept of new product development is discussed and the different stages of the process of new electric motor development are analysed taking into account its objectives, implemented procedures, functions and responsibilities division. In the article, information from secondary sources and the results of empirical research – conducted in an international manufacturing company – are used. The research results show the significance of project leader and regular cooperation with final client in the NPD process.

Key words: *new product development, project management, production management*

INTRODUCTION

New product development (NPD) process is essential for the creation of products that satisfy needs of industrial customers and differentiate company among competition. The NPD process has specific character in case of industrial sector, taking into account the level of product personalization and possibilities of close cooperation with final client.

The traditional sequentially executed new product development process, based on the concept, development, validation and manufacturing phases, has been outdone and the present most used and successful approach is the one that integrates stages and functions. The design of an industrial product is nowadays strictly integrated into the whole process of development and production of the item and there is no longer a sequential distinction between the different phases of concept, design and manufacture, as was common in the past [4]. In majority of companies, product design is an element of the new product development process (NPD) as one of the different functional areas. The expertise of industrial designers can provide important support for the NPD team at most stages of development. The design function is integrated in the NPD process [9]. Thanks to IT technology, such as computer-aided design, engineering and manufacturing (CAD/CAE/CAM) tools as well as advanced prototyping technology, it is possible to support product design from concept to detailed designs and ultimately manufacturing [4]. Computer-aided technologies are presently used in most companies in new product development process.

This aim of this article is to present the process of new product introduction on example of industrial sector in context of new product development (NPD) concept.

NEW PRODUCT DEVELOPMENT (NPD) PROCESS

The key stages of the new industrial product development are: concept, design and production. In the fifties of

the last century, during the development of mass production based on the Fordist model, these stages were considered sequential. The sequentially executed product development process often results in a prolonged lead-time and an elevated product cost [3]. To improve the effectiveness and efficiency of the new product development process, the sequential approach has evolved into a more integrated and simultaneous one, where the different stages are not separated and the first product concept can be modified and improved through meetings, discussions with clients and suppliers and feedbacks in every stage of the process. In consequence, companies has modified employed technology and human-resource management [4].

The process of NPD consists of several key stages, including identifying customer requirements, developing a product concept, generating a detailed design, testing, and product commercialization. At each of these stages, a number of functional areas are involved – R&D, marketing, and manufacturing, among others – and effective communication and collaboration is fundamental to the development of successful products. The most common way to manage the different stages and functions involved in NPD is the universal Stage-Gate' methodology developed by Cooper and Kleinschmidt [7], which specifies the responsibilities of each functional area at each step of the process. The main benefit of Stage-Gate is that it ensures that different perspectives are considered when key decisions are made, thus preventing oversights [9]. The Stage-Gate system was studied by several Authors and it proved to be an instrument that top-performing companies use often and well [5]. In the conditions of current market, the Stage-Gate system, also known as the Ideato-Launch process, must be regarded as a standard for a formal new product development process. The new product development (NPD) literature stresses also the importance of a clear management process. Researchers have noted that all functional areas

should be involved in NPD [14]. According Cooper [5] successful new product development needs a robust process, in which the responsibilities of members of the cross-functional team are clearly defined. This team requires good leadership [1] and good open communications [13]. As new product development process is conducted under strong time pressure, there can be considerable friction between different functions, for example sales and R&D. It is why, this process should be carefully managed [7]. It is also crucial to recognise customer needs. Successful product design rests on first understanding customer needs and then developing products that meet those needs [10]. In their review of the system, Cooper [5] and Cooper and Edgett [6] emphasized the importance of gathering the "voice" of the customer and its impact on the final product structure. Herstatt and Stockenström [11] concluded that, in addition to knowing customer requirements, the gathered information has to be translated into technical specifications and integrated into the product concept.

Today, computer-aided technologies enable companies to effectively manage the new product development, taking into account all resources and costs, from the concept and design stage to the production processes. The type of information systems used in the company depends on the type and nature of the product, the complexity of the product offering, the degree of sophistication of the production process, the number of partners, the degree of internationalization of the offer and the number of customers.

RESEARCH CHARACTERISTICS

The empirical part was based on an analysis of the results of own research. The research was based on case study. A case study is used to look into certain phenomenon, person, group or any subject that requires studies. The case study can be both based on information already available and provide analysis for that or it might need some additional scientific research in order to investigate a problem. Cases have become a source of reliable data and often provide important observations [12]. The studies were conducted in chosen company from industrial sector. Semi-structured interviews were conducted in 2017 and were addressed directly to the managerial staff of company in Polish subsidiaries. The observation method was used also. The studied company is a producer of industrial equipment and systems and is a technology leader. Company operates in more than 100 countries and is one of the world's largest supplier of industrial electric motors and drives for different industries and transportation and infrastructure operators.

The research methodology was chosen based on the classification proposed by Czakon [8]. During realisation of the research, data were obtained from secondary sources (internal materials) and from primary sources (semi-structured interviews among company representatives addressed directly to the managerial staff, passive observation). Semi-structured interviews mostly focus on the interviewee's opinion and experience, aiming to get rich and in-depth data [2]. This kind of qualitative research might be perceived as rather subjective, due to the personal involvement of the researcher in an open study and difficult to be an object of generalization. On the other hand, generalizing to a population is not the main goal of qualitative research. It aims at understanding and discovering deeply a particular case and perspective.

The purpose of this research was to examine and evaluate the process of new industrial product development.

NEW PRODUCT DEVELOPMENT PROCESS IN THE STUDIED COMPANY – RESEARCH RESULTS AND DISCUSSION

New product development process in the studied company is analyzed for the electric motors. In investigated company, this process is well structured and it is possible to distinguish its objectives, implemented procedures, functions and responsibilities division. All process of new electric motors development is managed by division of Global Technical Support (GTS).

In the company, this process is managed on a basic of the special procedure. Its aim is to:

- develop consistent workflows within the GTS process,
- clarify process steps and responsibilities,
- understand all tasks and process of new products implementation,
- define interfaces with other departments,
- reduce the risk and make process more transparent,
- establish new workflow path for customized motors,
- define roles and responsibilities.

The process of new product development is based on cooperation between designers (mechanical and electrical engineers), different departments of the company, managerial staff, suppliers and clients. The product development process lasts up to 1 year. The process consists of four stages (Figure 1):

- Stage I – feasibility study; this stage lasts from 2 to 5 weeks,
- Stage II – design phase; this phase can last up to 6 months,
- Stage III – preparation of the prototype, final costs and price estimation; this stage lasts up to 5 months,
- Stage IV – manufacturing.

Realization of the new project starts with creation of business case study document. Document should be filled in by regional sales manager that is responsible for identification of needs of existing clients and searching of potential customers. Next step includes feasibility study. The purpose of the feasibility study is to check overall attractiveness and technical possibilities of fulfilling customers' demands. Stage I begins with the indication of project leader – the person responsible for its coordination, contacts with the sales department, customer and partners involved in project preparation. The project leader can be a mechanical engineer, who is also a motor designer. In the first phase, the resources necessary for the implementation of the process are verified. Project leader develops a project plan and assesses its risk based on the identified customer needs. At this stage designers also prepare a list of possible solutions and calculate a preliminary cost. Project leader in collaboration with the production and supply chain department verify the production capabilities needed for the customer's acceptance of the project and its implementation in serial production. The initial project documentation with the cost estimation is sent to the regional sales manager who communicates with the customer. In the absence of client approval, the project is rejected, if it is accepted, it goes to stage II.

Further procedures depends on the customer feedback. The responsible department is Global Technical Support (GTS) that makes feasibility study with all required documents.

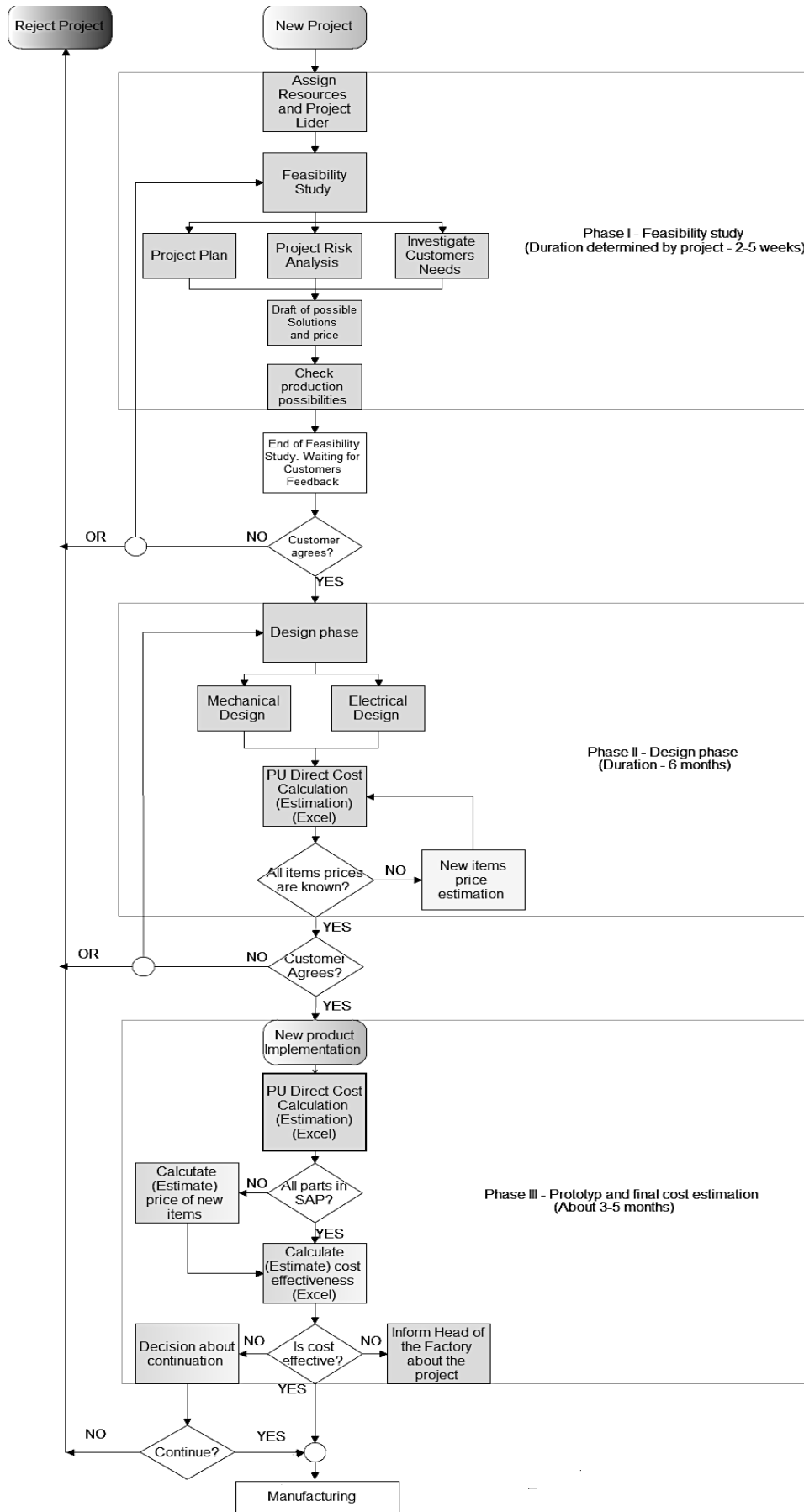


Fig. 1 New product development process in the studied company

After receiving the customer decision, the design stage is started. At this point, the new product project is being prepared. Mechanical drawings and electrical design has to be created. On this stage a direct cost of the motor is also calculated. In case of big or risky projects calculation should be done and checked by financial controller (FC). Supply Chain Management (SCM) department is also engaged. SCM helps with a new components price estimation. After acceptance of the final project by client, the stage III is started. The prototype is constructed and after its testing, the final costs are recalculated – taking into account possible modification and the tests results. The accessibility of parts in SAP system and possibilities of cooperation with needed suppliers are checked. The cost effectiveness is calculated and final decision about product implementation is taken. In case of not cost effective motors, decision of the head of the factory is needed. The final stage of new product development in the studied company is manufacturing process according to the specifications prepared by project team. In this stage the parts lists are introduced to the SAP system, rating plates are created, component codes are introduced in the ordering system, and instructions for production department and data for the robot used in the production process are prepared.

Project leader is assigned to each new product development process. Its role is essential for product development. The project leader has the overall responsibility for the project. This includes:

- approving prepared “road map” created by responsible engineer at the beginning of project,
- defining goals and time to achieve them,
- keeping project road map on time,
- tracking and managing the project according to the project plan and description,
- managing the project communication between team members,
- coordinating communication of the team with other departments – contact person role,
- distributing tasks for the GTS members,
- ensuring, together with the client, that all necessary inputs, funds, resources, and equipment are available,
- coordinating goals and schedules with other projects as necessary,
- supervising the project expenses and the working time of all project team members,
- ensuring that all goals of the project are fulfilled,
- identifying and taking corrective actions on any problem which may affect the project schedule,
- identifying and taking corrective actions on any problem which may affect the quality, cost, or function of the intended project result,
- regularly reporting the project progress, resource and financial situation, quality status, product cost, and all issues which cannot be resolved within the project to the steering group of the project,
- owning the product ramp-up process.

In the discussed process of new electric motors development, the employees of the investigated company use software from external and internal sources. The company uses basic Windows software tools, classic engineering design software (like AutoCAD), SAP ERP system, as well as the own advanced applications dedicated for specific functions like electric motors tests or creation of the rating

plates. Application of the ICT improves the management of process and cooperation between different project actors. Very important in this process is internal cooperation: among project leader and team members, team and different companies departments. However for successful product implementation external cooperation with final client is indispensable. Its approval at different stages is crucial for the product development and help to avoid unnecessary work.

CONCLUSIONS

The development of modern information technology allows for implementation of computer-aided design, engineering and manufacturing in the new product development process. Computer support can be applied at every stage of a new product's development. However, today, electric motors producers must, in addition to creating new, technologically advanced solutions, have the ability to create a competitive product offering. Clients expect advanced and innovative solutions in a short time and at attractive price. Consequently, designers, in addition to designing, selecting, validating, and optimizing motors features, must have the skills of teamwork and complex project management, which involves preparing plans, cost estimations, and coordinating team activities in permanent cooperation with suppliers, other departments and clients. The research results confirmed the significance of project leader and regular cooperation with final client in the NPD process.

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