



¹.Darko JOSIFOVSKI, ².Robert MINOVSKI

DEFINING A PERFORMANCE MEASUREMENT SYSTEM AS AN IMPROVEMENT TO THE NEW PRODUCT DEVELOPMENT PROCESS

¹⁻². University of Ss. Cyril and Methodius, Faculty of Mechanical Engineering, Skopje, MACEDONIA

Abstract: The aim of this research is to identify potential solution to a performance measurement and management method within the new product development process to improve transparency, efficiency and the management of this process. The focus is on defining the detailed requirements on a lower/deeper working level to allow improved monitoring and effective management. Expected results of the optimised process would be successful/timely launch of new products in batch production and on the market, reduced warranty claims, achieving financial targets, to list some of the main improvements.

Keywords: New product development, Performance measurement and management systems, LFA

1. INTRODUCTION

The dynamic and fierce competition in the automotive industry - necessitates a continuous fight for survival and drives a consistent need for organizations to change and adapt [1].

New product development and marketing are complex processes consistently challenged by problems that need to be effectively resolved prior to the product ending up in the hands of the customer. In spite of the Original Equipment Manufacturers (OEMs') persistent endeavour, a large number of problems are being identified by the users that in turn have negative effect on the safety relevance of the product, the brand value and the operational costs of the company [3]. On today's globally competitive markets an effective new product development process is a key contributor to a successful company. The new product development is a proactive process that allows a company to appoint appropriate resources to analyse markets to identify potential new or improved products [4]. Meeting customer expectations it's not an easy task. The customers' expectations are consistently increasing as the quality of the products on the market improves. Making informative and complex decisions during the development stages of a new product requires an effective coordination and management of all business functions in a company, like: marketing, engineering, production, sales and of course the final user. Therefore, the established new product development process needs to have a structure to allow the voice of the customer to be heard during all development stages. Complete business integration could only be achieved by establishing an integrated system that allows the business strategy to be linked with the key business processes and activities on all working levels which is the essence of effective performance measurement and management method [5, 6].]. In that sense, the role of the Performance Measurement Systems (PMS) in the process of new product development is very essential but is usually followed with certain obstacles [2]. When it comes to an automotive industry it is even more problematic due to the complexity of the product. This usually results in a rough PMS focused on more general level and qualitative and vague targets to meet, etc.

2. RESEARCH OBJECTIVE AND METHODOLOGY

The objective of this research is to improve the actual performance measurement and management method within the new product development process in order to improve transparency, efficiency and the management of this process.

As an introduction to the implemented methodology of this research, the Figure 1 shows the approach to defining the aim of this research. The methodology of the research focuses on several steps. First, (1) the **actual situation** concerning the performance measurement and management system within the new product development process **is analysed**. Then, (2) **the problems are highlighted** and their **interdependences** are identified. Afterwards, (3) the **goals** that should lead to improved situation **are identified**. Then, in order to focus the efforts to the most important aspects, (4) the several goals are detected as **priorities for improvement**. After that, (5) the **partial improvements are defined**. Concurrently to this, (6) **the entire system is determined**. At the end, (7) **the verification and the validation** of the proposed system after the trial implementation is done.

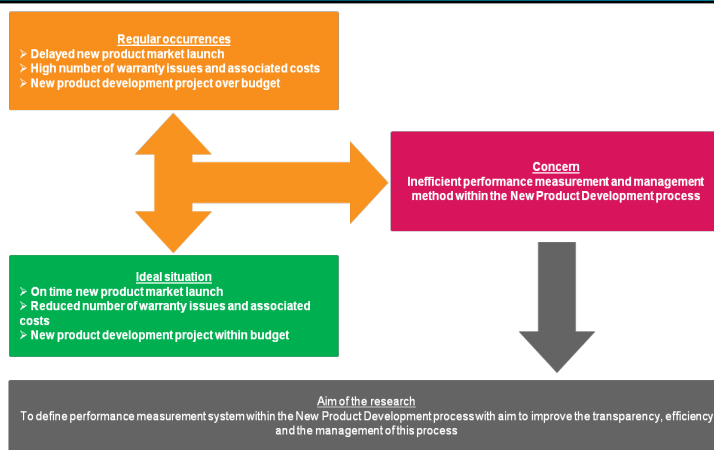


Figure 1. Aim of the research definition

planning stages of a project); Unclear management of responsibilities and accountabilities between stakeholders; and Lack of consolidation between key project activities and the final aim that the project needs to achieve.

It is accepted that the new product development process is a complex process that manages all activities within all functional areas of an organization during the development stages of a new product [4]. In this research paper the gateway process to develop new products has been accepted as a foundation for further improvement in line with defining the detailed requirements on deeper working levels to effectively and accurately measure the performance and therefore manage the process [8]. On a higher level, the gateway process is seen as an effective way of presenting the required information as inputs and the executive decisions as outputs at each development stage of a new product. The main aims of each of the gates within the new product development gateway process are: (1) to measure projects achievements against objectives; (2) to be an opportunity to present the progress status; (3) to assess the project progress; and (4) to obtain 'project-go' through a gate. With regards to the innovative aspect of this paper, according to [9] the research is aiming at a partial innovation of an existing process (Figure 2).

3. DEVELOPMENT OF THE SYSTEM

The analysis of the current situation (analysis of the "Regular occurrences") showed certain shortcomings that according to the LFA were structured in the problem tree. Due to the space limitations, here only a short list of those shortcomings is presented: Subjectivity in the performance measurement (decisions made on subjective performance indicators); Not passing through project gateways right-first-time; Lack of consolidation and alignment of requirements between project gateways; Lack of alignment and synchronization between key project activities on working level (key activities could not be completed due to others that must be completed first); Performance self-assessment on working level; Project going over budget; Lack of organizational lessons learning and knowledge base development.

To understand the progress of the new product development process it is necessary to effectively measure the performance and therefore manage it [10, 11, 12, 13, 14, 15, 16]. To ensure that, it is necessary to: Define the organizations strategic objectives; Identify organizations important aspects in order to measure those and therefore manage them to ensure effective and efficient organizational performance; Define measurable Key Performance Indicators (KPI's) to objectively measure the organizational performance (the adequacy of the performance measurement system will depend on the efficiency of the defined measure); Ensure systematic and integrated approach that will synchronize the organizational strategy with the key processes and activities. All of the above lead to a strategic performance management [17].

In Figure 3 have been presented the cause and effect diagram of a number of activities to improve or completely eradicate the afore mentioned problems leading to improved new product development process. All the improvement activities identified in the diagram are actually enablers and drivers for the top three indicators for an effective performance management in the new product development process: QUALITY - The reduced number of quality warranty issues; TIME - On time new product launch on the market; and COSTS - New product development project within budget.

As a result of this research, summarized the improvement approach have been defined within the following strategic management principles: (i) Clear understanding of the organizational strategy; (ii) Establishing a learning culture within the organization; (iii) Defining relevant KPI's; (iv) Establishing analysis of the organization performance and its management; (v) Achieving

The methodologies that dominate in this research are the Logical Framework Approach (LFA) – as a tool for detecting the problems and improvement objectives in the initial stages of the research methodology and associated new product development and performance measurement methodologies.

The LFA has been utilized due to its relevance and universal use. LFA has been adopted as a project planning and management tool and regularly suggested by the European Commission to be used by multilateral and bilateral development agencies [7]. LFA is designed to address three basic concerns: Vague planning (lack of clarity and defined objectives in the

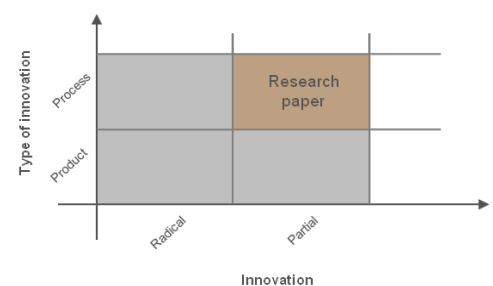


Figure 2. Innovative aspect of the research

organizational synchronization; and (v) Effective reporting and communication. The improvement within these principles and their consolidation and focus as a common goal lead to defining the detailed requirements on a lower/deeper working level to allow improved monitoring and effective management of the new product development process.

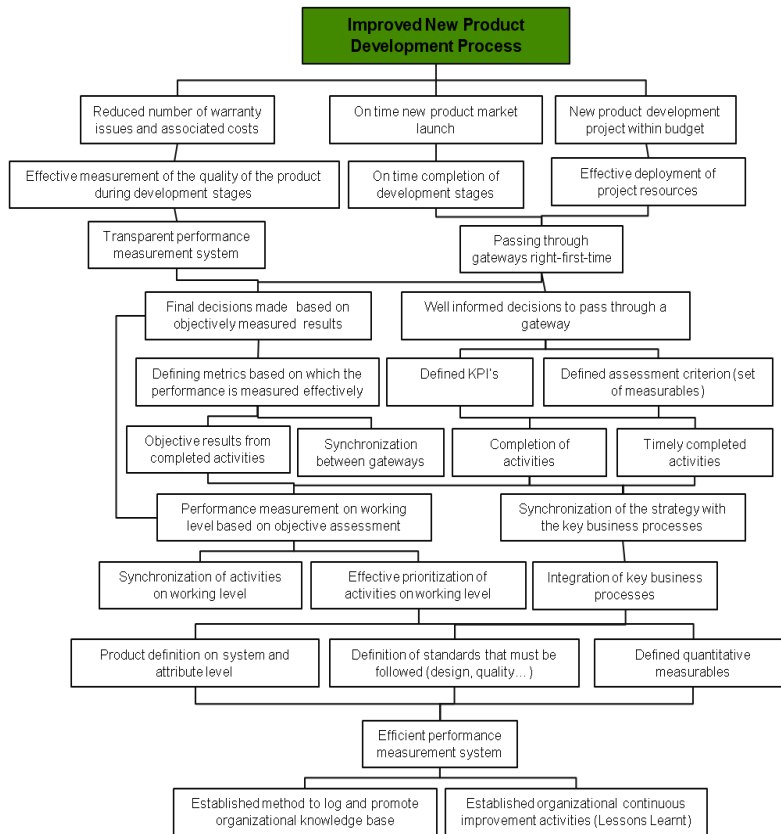


Figure 3. Cause and effect diagram of identified improvements leading to improved new product development process - the objectives tree

The end result of all improvement activities against the identified principles led to definition of two-dimensional matrix for the new product development process according to which the business performance is being measured however with improved transparency, effectiveness and management of that process (Figure 6).

As a case study this system for performance measurement and management within the new product development process was implemented in an organization in the automotive industry and has been used to develop their new products. Since a development of a new product is a lengthy process there is a limited information with regards to the success of this method. However all available information so far has been positive. To list few of the reported improvements: The first three of the ten defined gateways were passed right-first-time with no budget and resource related issues; Improved understanding of the customer related requirements; Improved interactions of the Design Office with other functional areas of the organization (Marketing, Quality, Production...); Engagement of the Operations Management Function/Sector at the earliest opportunity in the development stages of the new product; Focused design i.e. designed-in quality. The following validation items will need to be confirmed once

Due to the space limitations only the implemented improvements against the "Establishing analysis of the organization performance and its management" principle has been explained here. The fundamental improvement was to remove the subjectivity in the performance measurement and management by identifying all critical activities on a deeper working level and defining the method for their control and management. In Figure 4 an example of one gateway (GW1) with 8 gateway objectives has been presented. Those objectives are broken down further to 39 lower/deeper level gateway deliverables spread across all functional areas of an organisation. Further, each of those lower/deeper level gateway deliverables have defined activities that must be completed in order to achieve the deliverable and therefore the gateway objective. In Figure 5 an example of a lower level gateway deliverable document that includes the defined controlled items and measurement criteria has been presented.

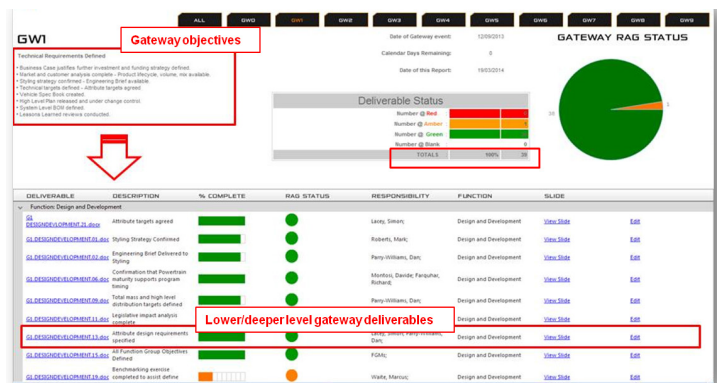


Figure 4. GW1 Gateway objectives broken down to lower/deeper level gateway deliverables

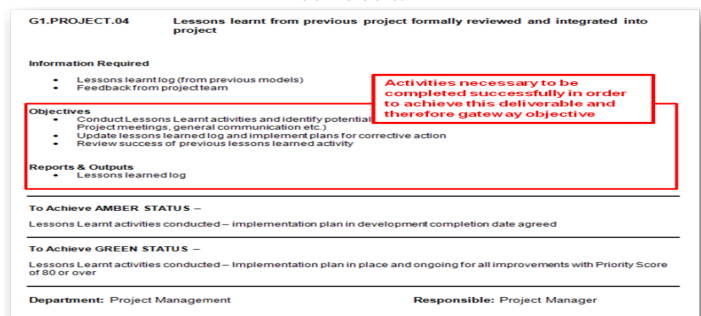


Figure 5. Lower/deeper level gateway deliverable with defined control items

the new product has reached the series production stage and is introduced to the market: Effective cost analysis i.e. cost of quality; Project budget assessment and status; Effectiveness in project resource deployment; On time new product launch on the market; Warranty issues analysis and status.

4. CONCLUSIONS

The new product development process is very important having in mind its implications on the quality, time, costs, flexibility etc., aspects of all processes that follows. Having effective and efficient performance measurement system is one of the key prerequisites in order to manage this process. This is even more important when dealing with complex products like vehicles. The complexity of the problem usually results in quite simple, but unfortunately ineffective performance measurement system in the praxis.

This research shows the efforts to create comprehensive performance measurement system that should support the process of development of the new product in automotive industry. The system already showed significant improvements in the new product development process. In the meantime the implemented system will continue to be monitored and analyzed to get a full picture of its effectiveness and efficiency and for further improvements and fine tuning.

With regards to further development of this system the following directions could be taken: (i) Expand the definition of the detailed requirements to include the development aspects for a platform as a base to develop multiple models; (ii) Redefine/scale this system to be implemented at the suppliers deemed as partners and for those vehicle components/systems that are deemed critical for the product; and (iii) In line with the previous one, considering the development of an engine is equally complex process to developing a new model vehicle, this system to be implemented at the engine supplier to establish stronger consolidation and synchronization of the development processes.

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Figure 6. Part of the two-dimensional matrix for the new product development process as organizational performance measurement system