

Agile Stage–Gate Hybrid Framework for New Product Development

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INTRODUCTION

Since 1990, New Product Development (NPD) theory has considerably evolved distinct new practices, tools, techniques, and management frameworks (Cooper, 2019; Summers & Scherpereel, 2008). New products screening models have been developed such as a study that compared US and UK manufacturing firms and which depends on the type of product (old or new). This approach was used by Xin et al., (2008) so as to compare British and German machine tool manufacturers. This discriminating method was used in the field of NPD and especially in Phases I and II of Project SAPPHO and Project NewProd Phases I and II in order to compare new products in different industries. However, a complete 100% implementation of a product development process might be a misnomer as all processes are to be both flexible and situational so that they could match the dynamics of technologies, markets, and organizations (Biemans et al., 2015). Thus the search for appropriate NPD models or different approaches has become a new emerging topic both for scholars and practitioners resulting from the new disruptive innovation environment which has challenged NPD theory and practice in recent years (Cooper, 2017; Summers & Scherpereel, 2008).

As many companies have no formal NPD systems yet, ad hoc systems provide decision makers with too many discretion which leads to mistakes. So, some companies have opted for managing NPD within a formal system in an attempt to avoid those mistakes. Yet, a need to adapt Stage-Gate models is pointed out so that higher levels of flexibility and agility can be achieved (Conforto & Amaral, 2016; Ettlie & Elsenbach, 2007). The Stage-Gate model is the world's most widely benchmarked, referenced and implemented innovation management model which has been used by companies of all sizes and it has adopted in many industries. This model is used in order to help companies to develop and launch successful new products. Despite the positive effects that this model had in many companies, Stage-Gate has attracted a number of criticisms. It focuses on the financial perspective of NPD process, it is rigid and linear and it cannot handle innovative projects (Cooper, 2014).

One of the latest results of these researches on NPD management is agile NPD, which has recently, in the early 10's emerged in an attempt to manage the increasing complexity of the NPD process. The agile methods originate from the software development industry and are being increasingly adapted by research and development industrial companies, amongst others. Software development is almost infinitely divisible and consists of million lines of code that can be broken down into one hundred increments of approximately 10.000 lines, each increment yielding a working product. It is more than obvious, that

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physical product development is something much different. The development of a new machine for example, or a new food product, or a polymer cannot be incrementalized. In such a way, therefore the concept of short time-boxed sprints cannot be applied as well (Cooper, 2014).

Recent academic findings show that agile methods are applied within the context of existing Stage-Gate NPD models. Also, what is indicated by the findings is that NPD performance is significantly improved after the implementation though rather than replacing the existing NPD standards, the agile framework is just emerged into them (Sommer et al., 2014). But studies regarding the transformation of the product development process and the integration of agile systems in the NPD process are limited. To this view, the main research questions are: Can agile be integrated with a traditional Stage-Gate model? And can the resulting hybrid model also be used for the development of physical products? (Cooper, 2017; 2016; Cooper & Sommer, 2016).

Thus, the purpose of this chapter is to provide a systematic approach regarding the implementation of the Stage-Gate model and agile software in NPD process. Authors derived recommendations for practitioners who want to study Stage-Gate and agile methods in NPD and a research agenda for academics that highlights the need for further research in this area. In addition, the resulting systematic overview is useful as a reference work for researchers in the field of NPD and helps them identify both related work and new research opportunities in this field.

The reminder of the chapter has been structured as follows: The next section describes the theoretical background regarding Stage-Gate and agile manufacturing. Then, solutions and recommendations for practitioners are discussed in next sections. Finally, conclusion and suggestions for future research conclude the chapter.

BACKGROUND

Stage-Gate Models

The NPD process is usually described as a complex set of activities taken up with a view to reduce the uncertainty regarding market needs and product process technological choices (Biazzo, 2009; Van Oorschot et al., 2010). Specific challenges that industry usually faces can be the dynamic volatile and unpredictable nature of demand, short life cycles of products, high levels of product variety and frequent product range changes and complex extended global supply chains requiring quick responsiveness to trends. Another not only significant but also gradually challenge for the industry is cost of excessive and underperforming innovation, though, that does not enhance performance and hence is superfluous rather than functional. This can be caused either by excessive NPD that dilutes overall profit margins or by design and development costs that exceed the product margin. A large number of low volume product can also be a factor since this can significantly damage relationships with vendors (Baker & Bourne, 2014; Ettlie & Elsenbach, 2007; Gunasekaran, 1999; Kettunen, 2009; Leite & Braz, 2016; Sommer et al., 2015).

Strategically, what provides real competitive advantages for a firm drew new products well attuned to the voice of the customer, with perceived technical superiority and developed within budget while launched ahead of the competition. If managers want to increase the success rate of their new product efforts, they have to master techniques for planning, development, evaluation and control of necessary competencies throughout the NPD process, literally speaking from the generation of the new idea to launch of the product at the marketplace (Fredberg & Piller, 2011; Tzokas et al., 2004). Implementing formal processes in NPD improves teamwork communication. It also has a positive impact on new

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