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Serial Innovators' processes: How they overcome barriers to creating radical innovations

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ABSTRACT

Formal new product development processes typically are depicted in the literature as linear processes having some number of stages, each of which is completed by a cross-functional team. At the end of each stage a management committee makes a decision as to whether the project will proceed to the next stage, be stopped, or recycle through the previous stage to better complete some of the tasks or steps in the stage. Teams proceed stage by stage, until the product is launched into the market.

However, this formal process typically is positioned as occurring after the "fuzzy front end" (FFE), the chaotic, messy up-front part of new product development before there is a solidified concept. Because incremental, evolutionary innovations go through an abbreviated FFE, or even have none at all, these formal processes work quite well for them. However, radical innovations typically have very messy, chaotic and fuzzy front ends, which are not helped by these formal processes. Formal product development processes may actually act as a barrier to radical innovation. Very little research to date has investigated processes that overcome the barriers to radical innovation and allow firms to successfully bring radical innovations to market.

This research investigates the product development processes used by 19 Serial Innovators—individuals in large, mature firms who have been associated with one after another radical innovation success. We find that Serial Innovators' processes have four specific features that enable them to overcome organizational barriers and allow them to create and successfully commercialize radical innovations. Serial Innovators' processes:

- are not at all linear in nature;
- focus significant time and effort on the fuzzy front end;
- explicitly manage the transition from the fuzzy front end tasks and outputs (a proposed solution to a problem) to the more formal and institutionalized development process; and
- proactively work to create market acceptance.

1. Introduction

Much of the research in new product development (NPD) over the last two decades has focused on increasing the probability of creating successful products by improving and standardizing NPD processes. Research has taken the perspective that NPD could be managed like any other (complex) process. The underlying assumption is that standard methods and protocols could be put into place, and teams could follow the standardized process to repeatedly commercialize a stream of successful new products. To date, the majority of firms have implemented formal NPD processes (Barczak, Griffin, & Kahn, 2009; Griffin, 1997; Markham & Lee, 2013). While these processes have improved outcomes for incremental innovations, they have not been found to be as useful for radical innovations (Leifer et al., 2000).

While incremental innovations may be developed by personnel just in the engineering department, developing radical innovations typically requires three different types of personnel: inventors (technical personnel in the R&D labs); champions; and project managers. The R&D technologists responsible for generating new radical technologies for the firm operate in the Fuzzy Front End (FFE) of the innovation process, long before there is a formal product concept (Kerr, Von Glinow, & Schriesheim, 1977; McCall, 1998). These individuals have little or no market knowledge, and no desire to manage the political processes required to get the technology out of the lab and into the development phase of NPD (Sim, Griffin, Price, & Vojak, 2007). Champions are individuals who put themselves on the line for an idea of doubtful success and use any and every means of pressure to get a concept accepted for development (Chakrabarti, 1974; Howell &

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Higgins, 1990; Markham, 1998; Markham & Aiman-Smith, 2001). Champions usually do not create radical technologies, but find them elsewhere in the organization, such as in the R&D labs, see their potential, and manage the politics of gaining project acceptance (Sim et al., 2007). Finally, project managers are responsible for organizing the execution of the NPD project after all technical and market unknowns have been eliminated (Crawford, 2003; Turner & Miller, 2005). Basically, project managers shepherd the project through the firm's formal NPD process, once a technology has been turned into a product concept, and that concept has gained the organization's support.

Technologists typically operate only in the FFE before there is a product concept, while project managers take over only after the concept has been developed and the project enters the formal NPD process (Sim et al., 2007). This has been cited as one reason why it is frequently difficult for technologies to cross "the valley of death" from capability to product concept (Markham & Kingon, 2004). Different people and groups are responsible for these different aspects of radical innovation, with informally-arising champions acting as the glue between the inventing and development groups. That the responsibilities for these different tasks reside with people from different functions of the organization is a major barrier to radically innovating in firms.

However, there also are individuals in organizations who invent radical technologies, develop them into product concepts, gain organizational acceptance for the products, and even facilitate their final development in the formal NPD process. We call these individuals "Innovators." Innovators who have created and commercialized new products repeatedly are "Serial Innovators" (similar to serial entrepreneurs, Wright & Robbie, 1997). Innovators' processes are important to understand, since their depth and breadth of knowledge allow them to bring strong vision to the initial concept generation for a capability, which can result in superior products that bring significant profits to the firm (Griffin, Price, Maloney, Vojak, & Sim, 2009; Griffin, Price, & Vojak, 2012).

Accepting responsibility for all of the tasks involved with inventing, gaining political acceptance and facilitating the final development of a radical innovation is one way that Serial Innovators overcome some of the barriers to radical innovation. However, there are a number of other aspects of the processes they use that also overcome other radical innovation barriers. This research investigates the processes by which serial innovators create radical innovations. In-depth interviews with 19 serial innovators explored the processes they use to identify customer problems, invent supporting technologies and capabilities, and then shepherd those concepts through the organization's more formal NPD process. The next section reviews the literature on NPD and fuzzy front end processes. Following that, the methodology is presented. Then the results from our interviews are presented, and the article closes with a discussion of managerial implications.

2. Literature review

PDMA's most recent Comparative Performance Assessment Survey found that nearly 70% of respondent firms had implemented a formal product development process (Markham & Lee, 2013). The *PDMA Handbook of New Product Development* defines a product development process as:

> "A disciplined and defined set of tasks, steps and phases that describe the normal means by which a company repetitively converts embryonic ideas into salable products or services." (Kahn, Castellion, & Griffin, 2005, page 601)

Formal product development processes were first developed by NASA in the 1960s (Cooper, 1994). Their Phased Project Planning (PPP) process was an elaborate and detailed scheme for working on complex space projects. The PPP broke development into discrete phases. Formal review points at the end of each phase ensured that all of the tasks in the phase had been completed satisfactorily prior to committing funding for the next program phase. However, the process was engineering-driven, applying strictly to the product's physical design and development. No marketing, manufacturing, finance or people from other functions were included in the process. Eventually, use of the process migrated to the Department of Defense to aid in developing complex military equipment. Ultimately, PPP was adopted by a number of firms, starting with government contractor firms, but eventually moving into more general use. While the system did bring discipline to a previously ad hoc set of tasks, it was cumbersome and narrow in scope, dealing only with the physical development phase of innovation.

The first mention of a "product development process" in the academic literature is in 1966. Sherman (1966) quotes a study conducted by Booz, Allen and Hamilton (BAH) on new product management. BAH reported that innovation required more than just focusing on development, stating that "every step in the entire process of new product evolution must be carefully planned" (Sherman, 1966, page 42). They outline a 6-stage process that they suggest firms should follow in developing new products: exploration, screening, business analysis, development, testing, and commercialization. Additionally, they indicate that a go/no go decision must be made by management at the end of each stage. As projects proceed through the stages, many are eliminated as either infeasible or likely unprofitable—indeed the BAH study found that out of every 58 ideas screened, only one became a marketplace success (Booz, Allen and Hamilton, 1968). This is the first hint that an effective NPD process needs to extend beyond organizing just the development stage.

Since 1966, when the basic tenets of a phase review process were laid out, a significant amount of academic research on NPD processes has been published. One of the earliest, and certainly the best known, scholars on this topic is Robert G. Cooper, self-proclaimed inventor of the Stage-Gate™ process. His first article on NPD processes concluded from three case studies of successful product launches that effective processes need to: consist of a sequence of discrete stages, whose purpose is to acquire information; proactively integrate the marketing and technical activities; allow for activities to be conducted in sequence at times and in parallel at other times; and provide for making incremental commitments to projects over time (Cooper, 1976). Over the next decade, he (and coauthors) further developed, refined and researched what effective processes include, how well various steps are carried out, and what impact each step had on new product outcomes. Significant relationships were found between project success and adequately performing the upfront homework (preliminary market and technical assessments), business/financial analysis, development itself, in-house testing, pre-commercialization and the launch (Cooper & Kleinschmidt, 1988). Ultimately, Cooper's research culminated in the generalized Stage-Gate™ process of Fig. 1 (Cooper, 1996).

Throughout the 1980s and 1990s many researchers investigated formal NPD processes, determining which aspects of the process were most highly associated with success and developing more effective processes. Essentially, this research strove to take the "art" out of product development, making it into more of a science.

One of the underlying premises of Stage-Gate™ and other phase review types of NPD processes is their primarily linear nature. Indeed, one of the objectives of developing formal NPD processes was to eliminate iterating back into the earlier phases of the process necessitated by unmanufacturable or unmarketable concepts having proceeded along the development path, which increased development time.

Formal NPD processes have increased success for incremental NPD projects (Markham & Lee, 2013). However, formal processes may not be most appropriate or effective for all NPD contexts, and especially for radical products. For example, Jin (2000) empirically found that firms are more likely to use more non-linear processes with newer (less incremental) products. Lynn, Morone, and Paulson (1996) found that product development for discontinuous