

Overpowering Environmental Inconsistencies During NPD Activity Ensures Sustainability

Part of courage is simple consistency. ` Peggy Noonan

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Abstract – Reality remarks that the companies are not remote from their environments; their new product development (NPD) strategy is altered by several factors. These can either be inherent from the company's external environment such as Industry market, Government policy, competitors or the internal environment which relate to the company strategy, organization, culture etc. Innovation is the core activity that guaranties a sustainable place in the market for research and development companies nowadays. Developing new or enhancing previous products capability and features are among innovation's forms that allow companies to diversify their portfolios and respond to their customers' needs. Numerous theoretical and empirical studies are trying to delineate the most critical success factors for the NPD activity and establish a pattern that would be suitable to reflect the NPD requirements and constraints to achieve better performances. The literature dealt with the performance of NPD activity and tried, in that sense, to come up with a framework of metrics in order to quantify the NPD performances. Taking into consideration the above mentioned success factors, the conclusion confirmed that the most suitable NPD configuration can be established on a case-to-case basis.

Keywords: Innovation, New Product Development, Environmental contingencies

1. INTRODUCTION

In the quest for managing the organizational innovation process, the first and foremost important task and issues, that the management of the companies usually encounter, are the continuously balancing and resolution of the short term versus long term issues, accommodating the internal customers (i.e., Employees and stake holders) as well as satisfying the external customers and partners etc.

Sometimes, the inter-departmental set-up and environment becomes much tense just because the innovative process demands the contradictory actions and roles. For example: "On the level of research and development strategies, "Tension" relate for instance to the quality or novelty of

the product concept versus speed/ throughout put time of the product innovation process. Pursuing both simultaneously poses conflicting demands upon the organizational structure and (inter)actions for innovation in which Research and Development projects are being embedded (Van looy, Debackere and Bouwen 2002).

In the present competitive business world, the Companies aiming for success in the market opt for innovation and constant change in their business operations. But the companies struggle while opting for "innovation" as it is it-self a complex process for the Company to organize for innovation. Many companies find it extremely hard to cope with the highly complex nature of innovation as then these have to directly correspond with the complex nature of innovation process. The paradoxes in innovative environment can be identified as "forming pulse like form" as these are described as "having explicit objectives, temporary in nature, unique form, and also having reciprocal interdependencies." As mentioned earlier, that it is extremely difficult and critical to handle fully the paradoxes resulted due to the innovation processes.

However, the best technique to handle them through using time and space are as follows:

- Sequencing, (e.g., road maps, fish bone technique etc.,)
- Portfolio arrangements,
- Helix type approaches (e.g., Inter-organizational arrangements etc.)
- Reframing and third parties (Conflict management, matrix structures etc.)

There is no final recipe for best innovation management practices for the companies, or organization, to cope with the paradoxes, resulting out from the adoption of innovative process; the companies have to go about for finding the best fit for their situation to resolve the issues. However, the few considerable organizational arrangements are, "Using times and space" (as mentioned earlier), "Best practices approach" or by "Managing dualities" to resolve the issues.

New Product Development activity has been the focus of so many researches experts for decades in order to define the best practices in innovation and overall NPD activity. Unfortunately, as long as research advances, it becomes clear that there is no ideal way to manage and organize for innovation. However, understanding the organization context and the industry dynamics are of paramount importance in order to drive the new product development process toward success. The contingency

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theory implies that there is an optimal organizational structure that is suitable to certain contingency. Therefore, as long as there remains a balance between the key factors, the performances of the organization remain high.

Tidd (2001) argued that contingencies may rather put restrictions on management of innovation and organizational structure. He further presented, in figure .1, an overview on the interdependence between environmental contingencies, type and degree of innovation, organizational configurations and performances.

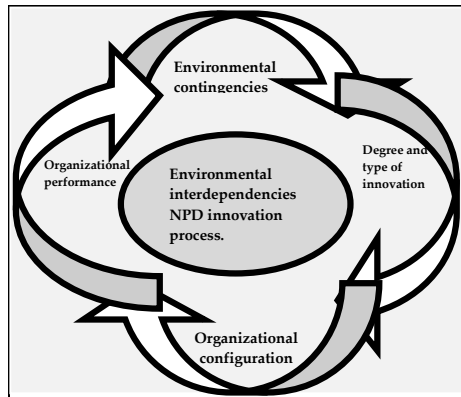


Figure 1. The relationship between the environment, Innovation, organization and performances)

The review of research projects concludes that environmental uncertainty and complexity are two dimensions that determine the type of innovation management to be adopted. Uncertainty depends on the rate of change of technologies and markets and complexity is related to the technological and organizational interdependencies. Each type of management requires specific strategy and organization structure. The following figure .2 gives a general view of this interdependence.

<p>Type of Innovation management : Innovative (High Uncertainty, Low Complexity)</p> <ul style="list-style-type: none"> - technical competences required - Functional structure 	<p>Type of Innovation management : Complex (High Uncertainty, High Complexity)</p> <ul style="list-style-type: none"> - Several competencies: Management, technical etc. - Flexibility, adaptation and learning are required.
<p>Type of Innovation management : Differentiated (Low Uncertainty, low Complexity)</p> <ul style="list-style-type: none"> - Marketing competences are critical - Multidivisional structure typical 	<p>Type of Innovation management : Networked (Low Uncertainty, High Complexity)</p> <ul style="list-style-type: none"> - Project Management competencies are critical - Professional structures

(Fig.2: Effect of Uncertainty and Complexity on management of innovation.)

The degree and the nature of innovation is also critical and can affect the innovation management process. Firstly, an

effort should be made to distinguish between the different degrees of innovations.

There are two types of innovation:

- Sustaining or Incremental: Sustaining innovations deal with enhancements in to an existing product or process.
- Disruptive: Disruptive innovations are totally different from any existing process or product.

It is recommended that during the product life cycle process and as the product become mature, the company would switch from radical to incremental innovation and start to develop further services, based on the established technology. Therefore the management process must also adapt accordingly. It is assumed however that no ideal pattern or configuration that can be applied to the NPD activity.

The purpose of research submission is to give an overview about the key aspects that affect the NPD activity. Initially I will try to highlight the nature of the NPD activity and analyze the inconsistent nature of environment (environmental contingencies) that may alter the behavior of NPD performances. In the later stage I will try to emphasize on the critical success factors of the NPD process while proving the point regarding highly inconsistent nature of NPD process providing less option for a standard “Best fit” option

2. THERITICAL BACKGROUND

Innovation through New Product Development is seen as paradoxical activity, in the sense that it requires balancing accurately between today’s work and tomorrow’s innovation. This means a best fit between the goals settled on a short term such as enhancing the quality of a product or reducing time to market for current products and long term goals that refer to handling future market requirements and adapting those requirements and needs by the NPD system. Thus, NPD performances reflect the effectiveness of today’s work termed as operational effectiveness - OE (De Weerd-N. 1998) and the ability to handle new products termed as Strategic Flexibility (SF). It is therefore very critical to have a correct judgment ability (i.e., know how) to assess these two dimensions correctly and efficiently. A specialized framework proposed to assess these two variables is related to what is called subjective parameters. Subjective parameters are determined by people who are involved somehow in the NPD activity in a given company.

According to Song and Parry (1997a), subjective scales will allow comparing companies’ performances on a macro-level taking into account their particular industry, time horizons, economics conditions and goals.

The constructs proposed by Brown and Eisenhardt (1995) were highly adopted. These constructs propose the measurement of OE and SF on the basis of product concept effectiveness and the process performances. The former is split into two sub parameters: fit with market demands and fit with firm competencies while the latter deals with the productivity, speed and the flexibility of the process. The next table is summarizing the whole metrics proposed to measure OE and SF.

Operational Effectiveness		
Product Concept Effectiveness	Fit with market demands	Customer satisfaction, Timeliness, Product price, Quality (Chiesa et al, 1996) Sales and profit impact (de Brentani and Kleinschmidt, 2004)
	Fit with firm competencies	R&D/Manufacturing Integration (Swink, 1999; Yam et al, 2004) R&D/Marketing Integration (Leenders and Wierenga, 2002)
Development Process Effectiveness	Speed	Speed relative to schedule (Kessler and Bierly, 2002) Development Time (DT), Concept to Customer Time (CTC), Total Time (TT) (Griffin, 1997) The speed and commitment of the NPD decision-making process (Griffin and Page, 1993)
	Productivity/ cost	Possibility for lower development budget (Iansiti, 1993) Cost relative to budget, competitors (Kessler and Bierly, 2002) Engineering hours, cost of materials, cost of tooling (Clark and Wheelwright, 1993)
	NPD Process Flexibility	Average time and cost of redesign, enhancement (Chiesa et al, 1996; Thomke, 1997) The ability to change specs late (Thomke, 1997)
Strategic Flexibility		
Future Product Concept Effectiveness	Anticipating market demands	Product-market options (Johnson et al, 2003) Windows of opportunity (de Brentani and Kleinschmidt, 2004) Proactive market orientation (Narver et al, 2004)
	Building competencies	Acquisition of resources (Kessler et al, 2000) Deployment of resources (integrate, apply knowledge) (Yam et al, 2004)
Future Development Process Effectiveness	Anticipating time constraints	Anticipating Total Time (TT) (Griffin, 1997) Anticipating the speed and commitment of the NPD decision-making process (Griffin and Page 1993)
	Anticipating productivity constraints	Anticipating cost relative to budget, competitors (Kessler and Bierly, 2002) Anticipating engineering hours, cost of materials, cost of tooling (Clark and Wheelwright, 1993)
	Anticipating on the need for NPD process flexibility	Anticipating average time and cost of redesign (Thomke, 1997) Anticipating on changes in specs (Thomke, 1997)

(Table 1. Reflection of theoretical chart for operationalization of operational effectiveness (OE) and Strategic Flexibility (SF). Adaptation - Kazmi. A (2012).

3. SUCCESS FACTORS IN NPD ACTIVITY

Research efforts through comprehensive empirical studies for approximately three decades have been arguing about the success factors of the new product development. These studies have been focused on the internal organizational elements or factors that influence the NPD activity. These parameters are actually the ones that can be influenced instantly by the management level of the Company. NPD success variables are classified according to the NPD process, organization, culture, role and commitment of senior management and strategy.

3.1 New Product Development process

Cooper's and KleinSchmidt's (1995) work has identified two important aspects that have a positive influence on the new product development process:

- The proficiency of activities in each phase of the NPD process. This includes the product development, test marketing and Market introduction.
- The use of market information along with the NPD process, at the company level.

The latter aspect was confirmed afterwards by further studies that reflects the importance of the commercial evaluation of the NPD projects before the development. Also the initial assessment of the market and technical assessment are decisive. Taking into consideration all what was stated above and the further recommendations of Cooper and Kleinschmidt (1995) , following four aspects can be suggest to bring further success in the process of NPD:

- Clear definition of the product concept and target market before the product development,
- Establishing further studies about the technical and market-oriented feasibility and commercial evaluation.
- Making research about the targeted market and the competition in order to align the NPD process along with the markets demands.
- High quality NPD process.

Integrating customers within the NPD process is of paramount importance. Not only in the earlier phases when the process needs to be aligned with the market needs but also at the prototyping and market introduction phase.

3.2 Organization

Cooper's and KleinSchmidt (1995) recommended a global picture of the requirements for the success of the NPD activity from the organizational point of view which is as follows:

- Strong and responsible project leader. This factor was approved by further studies. Actually, the Project leader must show enough authority to manage different people from different areas and also enough commitment to the project in order to motivate the rest of the team.
- Cross functional NPD teams. This factor has been seen by Brockhoff (1994) as an efficient instrument to overcome to the organizational interfaces. Moreover Cross functional teams encourage interfunctional communication and cooperation which promote success (Balbontin et al. 1999; Maidique and Zirger 1984; Yap and Souder 1994).
- A dedicated NPD team for the project. Other studies have shown that the autonomy of the NPD team has positive impact on the success of the project (Gerwin and Moffat 1997; Thamhain 1990).
- Commitment of the NPD team to the NPD project. Actually, the commitment of the project leader and his team may have a big influence on the success of the NPD project (Balachandra 1984; Thanain 1990).
- Effective communication between the NPD team members during the process of NPD. This can be achieved by sharing informations among the NPD team and organizing project meetings (Balachandra et al. 1996; Ebadi and Utterback 1984; Rothwell et al. 1974; Souder and chakrabarti 1987; Thamain 1990)

Another factor that was highlighted by a different researcher is "nature or form of the Organizational setup of the NPD organization". This factor will help to bring the above mentioned success factors into effect.

Following types of organization were proposed:

- Matrix and
- Task force models (Larson and Gobeli 1988).

The form of organization may depend on the priority that the NPD team is addressing. For example, in Telecommunications where time to market is very critical, a task force organization is the most suitable organization form for the NPD team (Hauschildt 1997).

3.3 Culture

The culture in a NPD organization refers on how new ideas or propositions are handled within the company. This principle was expressed by Cooper and Kleinschmidt (1995a) as Entrepreneurial Climate. Taking into consideration Entrepreneurial Climate the following aspects should be considered:

- An opportunity for employees to spend part of their work time in developing their personal ideas,
- Company support for work on unofficial projects, even if those projects are stopped by management,
- ‘Venture Capital’ structures to assist the realization of creative ideas.

The ‘product champion’ structures were also identified as success factor for new products. The ‘product champion’ principle implies that a dedicated team which its members show great personal commitment to the NPD project (Song and Parry 1997).

After all, fostering such internal organizations would be inherent to the innovation-culture within the company and to what extent they are encouraged. Sometimes, in order to overcome some internal obstacles blocking new products, associating champion’s team with a powerful ‘promoter’ is necessary (Fang, w., Ou, L. 2007). The promoter belongs to the senior management layer and can easily guarantee the necessary resources for the project development.

The figure below may summarize some of the key success factors for NPD (Holger E., (2002).

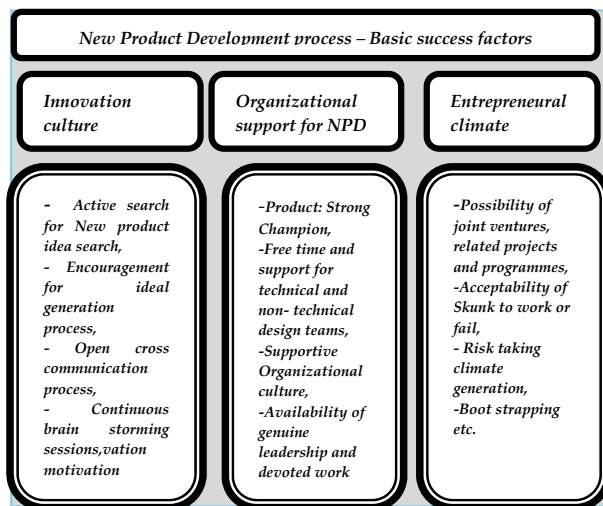


Figure-03: Conceptual Model for NPD Project success factors.

3.4 Role and commitment of senior management

As identified earlier, the commitment of the NPD team is one of the key success metrics for the NPD project. Cooper and kleinschmidt found that commitment is also necessary at the senior management level. This metric is of paramount importance because it is considered as a secure asset for the NPD team to get the required resources. Allowing resources would mean not only guaranteeing a long-life time for the project (Balachandra

1984), but also successful introduction of the product by investing in market research studies in order to have a better market orientation of the NPD process (Cooper and Kleinschmidt).

4. ORGANIZATIONAL STRATEGY IN LINE WITH NPD PROCESS

By focusing on the long-term strategy of the NPD program, Cooper and Kleinschmidt (1995) defined strategy as a construct of four variables:

- 1- The objectives of the NPD program.
- 2- How the NPD goals participate in achieving the company’s goals.
- 3- Strategic focus of the NPD program in order to draw a path for each individual NPD project
- 4- Long-term thrust for the projects in term of length.

Many Companies strive to create and introduce “New Product” to get market lead & profit gains and for doing that, they have to adapt or sometimes even have to transform their core operations in accordance with the changing environment. The usual aims of the “Patterns’ in New Product Development”, is to achieve and gain knowledge on managing the skills for the New Product Development, to maximize its efforts to achieve “Sustained Innovation”.

The companies striving for “Sustained Innovation” usually face the tensions, of the following nature, in their way towards the ultimate success:

- Tensions of current work against the targets of future’s innovation (Exploitation vs. Exploration etc.)
- Tensions between company’s current resources and strengths versus demands from its external environmental (cost vs flexibility etc.).

The main rationale behind focusing on “Patterns (configurations) in NPD” is that while pursuing for the “Sustained Competitive Edge” the company can find the best fit within the NPD system or with its overall context in comparison to the NDP System. (de Weerd-Nederhif, 1998). The fit or congruence means here the compatibility among different elements of the (NDP) system. The NPD process is a specialized and highly complex corporate activity. Hence, to analyze the conceptual framework and its operationalization the company has to have deep and extensive knowledge about its elements/factor (goals, management, support processes, people and resources etc.) that are interacting with several intra and extra-organizational factors and making the whole process more complex and sensitive to handle.

To understand the conceptual framework, the in-depth study of the related corporate strategy, culture and structure are the building block to assess the related patterns (Sherwin, C. and Ewans, S. 2000) for decision making and managing the sustainable innovation process. “When it comes to the integration of environmental considerations, it is important to understand the product development process and to be able to relate it to traditional theories of innovation and product development (Berchicci and Bodewes, 2005; Magnusson, 2003; Ritze’n, 2000)”. As the research dimensions of “Eco-design” is in the process of continuous improvement

and evolution hence it is hard to find out the best and final definition but the one which is widely acknowledged is the one coined by Sherwin and Ewans (2000): Research on the integration of environmental concerns in product development is often very general, concentrating on how to achieve successful eco design (Ritze'n, 2000;Cramer and Stevels, 1997; and Simon et al., 2000).

Anyway, the technical operational procedures then have to be realigned and adjusted to achieve the best and appropriate fit for the targeted “New Product Development” project(s) as well as sustained new product development projects. Successfully creating the best fit between “Product or System Innovation” and “Environmental Challenges It is widely acknowledged by the research scientists that “Eco-innovation projects should be managed differently from projects aimed at repair and refinement (Magnusson, 2000).

Therefore, the extensive research efforts in this field helped in the formation of following:

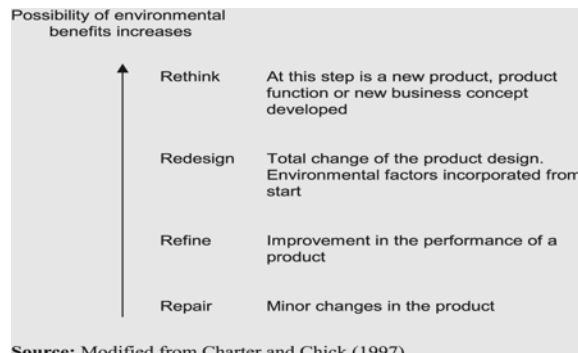
“Characteristics of radical innovation”

Project champion	Strong project champions with a vision for the product and the drive to advance the development are important (McDermott, 1999) (Verzyer, 1998)
Formalized stage-gate process unsuitable	Formalized stage-gate processes are not suitable for projects characterized by intensive technology development (Verzyer, 1998)
Uncertainty	The projects have a high degree of uncertainty regarding both the market and the technology (Verzyer, 1998).
Exploratory	The development processes are exploratory and less customer-driven (Verzyer, 1998)
Fortuitousness	The projects are messy and coincidence and fortuitousness play an important role (Verzyer, 1998)(McDermott, 1999)
Iterative	An iterative process exists for adapting product applications (Verzyer, 1998)
Networks	Informal networks inside and outside the company are important (McDermott, 1999)
Early phases	Early design and prototyping are essential (Verzyer,1998)

(Table 2. Sowing the list of characteristics associated with the notion of radical innovation.

Hence, the best Eco-design procedures must enhance and co-relate it-self with the radical and innovative development processes.

4-step model of approaches to environment improvements in Product development is as follows:



Source: Modified from Charter and Chick (1997)
(Fig- 4 Step models of approaches to environmental improvements in product development.

4. CONCLUSION

The NPD process is a specialized and highly complex corporate activity. Hence, to analyze the conceptual framework and its operationalization the company has to have deep and extensive knowledge about its elements/factor (i.e, goals, management, support processes, people and resources etc.) that are interacting with several intra and extra-organizational factors and making the whole process more complex and sensitive to handle.

However, after going through all the above literature on the support of theoretical frameworks it is now very clear to understand that there is no final recipe for best innovation management practices for the companies, or organization, to cope with the paradoxes, resulting out from the adoption of innovative process, the companies have to go about for finding the best fit for their situation (i.e., by using their own options among the available choices like; Using time and space, BPA, managing dualities etc.) to achieve sustainable corporate success on the basis of innovation resulting organizational productivity and growth.

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