# A Dynamic Risk Scrutiny on New Product Development Process

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### Abstract

In the energetic and spirited market, managers seek to discover effectual strategies for new product expansion. Since there has not been a meticulous research in this field, this study is based upon the review of the risks accessible in the NPD process and on the psychiatry of the risks during FMEA approach. Consequently, we can prioritize present risks and then model the actions of the NPD process and main risks throughout system dynamics. At first, we

# I. INTRODUCTION

Today, markets are normally supposed to be serious higher quality and higher performing products, in shorter and more conventional development cycletimes and at lower cost. The new product development (NPD) and modernization are often documented as the key processes of competition in a variety of markets. ring the creation stage and its introduction into a market place. To obtain best presentation from NPD, the proficient and successful management of the product development (NPD) strategy is an significant activity that helps enterprises to survive and make continuous improvements.

The NPD process, that its purpose is to translate an idea into a concrete physical asset, is prepared around well-defined phases; NPD can be defined as a progression including many "generic decision" points. Urban and Hauser suggest a five-step decision process for NPD: occasion identification, design, testing, introduction and life cycle management. Another NPD process proposed by Cooper (1979) based upon the steps illustrated below. For complete information about the process, we refer the readers to Buyukozkan et al. (2004). An additional conceptual model is shown by figure1that was a overriding model during 1980's for innovation process. Our study is principally based on this model. All stages of the process are affected by uncertain, varying information and dynamic opportunities, as described in the section 3. In this paper, we first portray the NPD definition, then its concepts and process. In the second section, we present the successful factors of NPD. In the third section, we consider the risks in the NPD process.

present new product development concepts and the key definitions. We base our study on the literature review of the NPD risks and then provide an FMEA approach to define risks priority. Using the obtained foremost risks, we model the NPD process risks applying system dynamics to investigate the system and the risk effects.

**Keywords** - *Product development, Risk analysis, Dynamic Simulation, Systems thinking.* 

New product increase is a serious endeavor in today's globally aggressive environment. New product development (NPD) is a business process for budding new products for a company, whether it is an upgrade of an existing product or a new concept It includes all behavior from the development of an idea or a concept for a product, to the awareness of the product du

# A. The NPD Process

- 1) **Opportunity identification** 
  - Market Identification
  - Idea generation
- 2) Design and development
  - customer needs
  - product positioning
  - segmentation
  - sales forecasting
  - Engineering
  - Marketing mix
- 3) Testing
  - Advertising and product testing
  - pre test and pre launch
  - Forecasting
  - Test marketing

# 4) Introduction to the Market

- launch planning
- tracking the launch

# 5) Life cycle management

- Market response analysis
- competitive monitoring and defense
- Innovation at maturity



Fig.1. The NPD Risk Analysis Framework

## II. NEW PRODUCT DEVELOPMENT AND ITS EFFECTIVE FACTORS

NPD is an interdisciplinary activity together with marketing management, organizations, engineering design, and operations management and requires charity from nearly all the functions of an activity, whether it is an upgrade or a new concept either to the company or to the market. One promising area of research in the literature is the impact of internal firm variables or organizational variables on the capacity of firms to minimize the time and cost of new product development (NPD). Thus, time and cost are two imperative factors in NPD process. NPD is also defined as the transformation of a market opportunity and a set of assumption about product technology into a product available for sale. Case studies of actual innovation showed that the market place played a major role in motivating the need for new and enhanced products. Market unavoidability, marketing skills and resources, gratitude of long-term relationships, crossfunctional interface, compatibility emphasis, cost and service emphasis and guidance style of project manager are some other factors introduced by Song (2006) for NPD. The project leader is an additional factor decisively touching both process concert and product effectiveness and facilitates communication among the project team and senior management. NPD process expertise and the role and commitment of senior management were key distinguishers connecting success and failure. In addition, good communication has been identified as critical to innovative success.

# **III. THE NPD RISKS AND UNCERTAINTIES**

Risk is definite as the degree of indecision and potential loss that may follow from a given behavior or set of behaviors. Ambiguity may be defined as the disparity between the amount of information obligatory to perform a particular task and the amount of information already possessed. It arises from a diversity of sources including technical, supervision and commercial issues, both internal and external to the project. It is also widely predictable and accepted that successful management of indecision is associated with project success, as the proactive project manager frequently seeks to steer the project towards achievement of desired objectives.

New product development (NPD) is a major driver of firm expansion and sustainable competitive advantage, yet risks are intrinsic in NPD in all industries. Thus considerate, identifying, managing, and tumbling risk is of strategic outcome for firms.

High-tech industries are characterized by technological indecision, market uncertainty, and aggressive volatility (Mohr, 2001). Fox et al. (1998) combine three dimensions of hesitation as technical, market and process. They rate and categorize uncertainty along each dimension as being either low or high. For technical indecision, when uncertainty is low, the technologies used in the development of the project are well known to the association and rather stable. When technical ambiguity is high, technologies used in the development of the project are neither extant nor proven at the start of the project, and or are hastily varying over time. For process indecision, when hesitation is low the engineering, marketing, and communications processes used in this project are well tested, stable, and rooted in the organization. When process uncertainty is high, an important portion of any all of the engineering, marketing. or and communications processes are comparatively new, unstable, or evolving.

NPD managers are unsure about how to turn the new technologies into new crop that meet customer needs. This indecision arises, not only from customers' inability to eloquent their needs, but also from managers' difficulty in translating technological advancement into product features and benefits. Finally, senior management faces hesitation about how much capital to put in in pursuit of rapidly changing markets as well as when to invest. Managers also should distinguish that disorderly environment heighten the required to make risky investments, and occasionally, risky decisions; risk-taking decisions ought to be optimistic in such environments promotion risk also involves ambiguity about competitive behavior and substitutes that may appear. Customers have fear, indecision, and doubt concerning whether a new product can meet their requirements and whether there may be possible problems with its use, varying needs

new product failure has been principally due to defective considerate of customer needs. Technology R&D risk refers to achievable risks throughout the stage of the technical development. Exclusively it includes technical risk, financial risk, and personnel risk at this stage. Commercialization risk of research result refers to promising risks from scientific and scientific development until mass production. The main risk, market risk, includes uncertainties and exposures faced by market players appealing in economic activities. When the new products are in the market, competitors arbitrate rapidly, which will lead to a competitive risk.

## A. Elements of the Proposed Model

Typically, the product expansion and process has been performed in numerous phases. The product consists of numerous more or less self-regulating activities that can be urbanized and maintain separately. In this study, the model is built up on 6 main factors in NPD process and one connector factor based on the information gathered in table 2. Fig 4 illustrates the structure of the model. Each foremost factor includes sub factors in which the possessions and interrelations are measured. The main factors are resources, financial, market, modernization, scheduling, and production factors. There are two actors in this model correlated to government and managers. The properties and behaviors of each actor influence all other factors. Additionally, the model is based on the following items of each element.

### 1) Resource Element

This constituent includes tutoring, technical know-how, new technology and register. The resource element brings about a carry for modernism element.

## 2) Financial element

This element largely includes R&D investment, and announcement which cause government and management support and the proceeds affect completely on it. On the other hand, this carry affects on planning element. Financial element could also be in relative with the market element.

# 3) Market Element

This element includes market share, command and sales. This element provides proceeds for the organization and it is pretentious by customer satisfaction.

## 4) Innovation Element

It includes imagination, product newness, and design. Resources provide acquaintance to innovation items through knowledge transfer. Modernism affects on design and quality.

## 5) Planning Element

It includes project planning and customer desires prediction which affects on supplier and delay and caused by management support.

# 6) **Production Element**

It includes construction and prototype speed and production faculty mainly affecting on price and affected by planning element.

Connectors connect elements mutually to bring about customer satisfaction.

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Fig. 2. New Product Development Structure's Elements

Risk alleviation actions reduce the original impact of a risk on a factor. If we take a look at the things of mitigation actions for each risk, we positively should observe the proficient results for the objectives we take in to deliberation. Since there are, we carry out our analysis based on 3 level variables; revenue, customer pleasure and inventory in adding together to sales, construction and quality as other 3 momentous variables. For each factor, we evaluate the four scenarios in order to show the risk effects at once. Compare with the second scenario, the first scenario in which the investment risk (IR) is decreased and the political risk (PR) remains constant, sales factor has the higher value. This resource that intriguing mitigation actions for the IR is more effective than the PR mitigation. The speculation risk has the direct effect on sales and revenue. Thus, it is evident that has the maximum effect on sales and revenue and the minimum effect on superiority and customer satisfaction. We can say that the speculation risk is the most critical risk for the company of this case study as it highly affects the NPD performance.



Fig. 3. The Positive Effect of Advertisement in New Product Development



Fig 4. Risk Mitigation Scenarios for Production

#### **IV. CONCLUSIONS AND FURTHER WORK**

In this revise, we present the main factors exaggerated in NPD process. It has accessible NPD risk scrutiny procedure using FMEA and system dynamics advance after reviewing on other studies of the associated field while there has not been a meticulous research for the NPD process risks. In order to depict the criticality of some risks, the examination is applied and examined in a safety garments manufacturer in Iran. Twenty three risk factors were acknowledged among which some are more critical. Based on the results achieved, the risk lessening action on the main NPD risks can dangerously influence on the process. The speculation risk was the main risk affects highly on Revenue and accordingly on profit as the objective of the factory and less on customer happiness as the customer objective. For further work, we propose to enter the lessening strategies to the model to show how it may reduce risks and to what level.

This article makes a important donation to the product development study due to the fact that it shows how FMEA can be used to compute some risk factors and how we can narrate them to the system dynamics in new product development. We analyzed the risks firstly during a case study by FMEA then by system dynamics for process modeling and hazard effects on the process.

## REFERENCES

- Buyukozkan, Feyzioglu A Fuzzy-Logic-Based Decision-Making Approach for New Product development, Int. J. Production Economics 90, 2004, pp. 27–45.
- [2] Kayis, B., G. Arndt, M. Zhou, S., Amornsawadwatan, A Risk Mitigation Methodology for New Product and Process Design in Concurrent Engineering Projects, Annals of the CIRP Vol. 56/1/2007.
- [3] Cooper, R.G., The Dimensions of Industrial New Product Success and Failure. Journal of Marketing 43:93–103 1979.
- [4] Coyle, R.G., System Dynamics Modeling. A Practical Approach. Chapman & Hall, London. 1996.

- [5] Wu, D.D., Kefan, X., Hua, L., Zh. Shi, D.L. Olson, Modeling Technological Innovation Risks of an Entrepreneurial Team using System Dynamics: An Agent-Based Perspective. Technological Forecasting & Social Change, 2010.
- [6] Davila, T., An Empirical Sudy on the Drivers of Management Control Systems' Design in New Product Development. Accounting, Organizations and Society 25, 2000, pp. 383–409.
- [7] Wu, D.D., X. Kefan, L. Hua, Z. Shi, D.L., Olson. Modeling technological innovation risks of an Entrepreneurial Team Using System Dynamics: An Agent-Based Perspective, Technological Forecasting & Social Change 2010.
- [8] Lee, E., Y., Park , J., Shin Large Engineering Project Risk Management using a Bayesian Belief Network, Expert Systems with Applications 36, 2009, pp.5880–5887.
- [9] Maier, F.H., New Product Diffusion Models in Innovation Management - a System Dynamics Perspective, System Dynamics Review Vol. 14, No. 4, Winter 1998, 285±308.
- [10] Forrester, J.W., Principles of Systems. MIT Press, Cambridge MA. 1976.