

Survey Analysis of Critical Success factors for NPD in Indian Manufacturing Industries

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Abstract

There has been a lack of specificity in which market research tools and techniques can be used to integrate the customer needs and requirement into a new product development process in order to increase the likelihood for success. This present paper will investigate how best to integrate customer market research techniques in a new product development process. In this Paper, factors have been addressed how to increase the likelihood of creating successful new products by integrating the customer into the innovative process using market research tools and answer the research objectives. 54 survey responses is being analysed using SPSS software. The salient finding indicates that, only few of success factors play key role for the success of new product in the market.

Key Words:Product development, NPD, CSF, Stage Gate

INTRODUCTION

In the short span of one morning, the average person probably uses a large variety of products before even leaving their home and, for the most part, never even gives a second thought to how those products were created. In just the last 20 years alone, the world has seen innovation reshape societies to the point that we can no longer imagine ourselves without certain products. This increase in innovation has had an enormous effect on how we perceive products as both manufacturers and consumers. Consumers use mobile phones, mail, Google, instant messaging and Internet shopping and is grappling with even more technologies for entertainment, such as MP3, DVD and high-definition TV (Smethers, 2007). Indian customers also have seen a tremendous change in technologies in last 20 years. Consumers are bombarded with new products at a higher rate of frequency than ever before but there are varying types of new products. There are six categories of new products outlined as follows:

1. New-to-World products – these products herein will be referred to as novel products and are products that are the first of their kind which create an entirely new market.
2. New product lines – products that are not new to the market place but are nonetheless new to a particular firm.
3. Additions to existing product lines – products that are new to the firm but that fit in a previously created product line produced by the firm.
4. Improvements and revisions to existing products – includes products that are essentially replacements of existing products in a firm's product line.
5. Repositioning – new applications for existing products and often involve retargeting old products to new market segments for a different application.
6. Cost reduction – the least new of all product categories is products that are essentially being phased out as firms introduce new products designed to replace this existing product in the line.

Each of these product categories provide consumers with different challenges including learning new technology, maintenance and/or replacement of parts and application consistency.

This present paper will investigate how best to integrate customer market research techniques in a new product development process. In this Paper, factors have been addressed how to increase the likelihood of creating successful new products by integrating the customer into the innovative process using market research tools and answer the research objectives. (1) what are best-practice studies indicating as causes of failure for new products, (2) what are the factors influencing the success of new products, (3) what market research tools are available that might contribute to a new product's success, (4) what information can be attained from employing each of these tools and how can that be applied in an innovative process.

Success Factors in Product Development : The idea of having a limited set of factors that affect the performance of the development of new products is appealing for both practitioners and researchers. As a result, a considerable amount of empirical research on the determinants of new product-development performance is reported in the literature (Ernst, 2002; Montoya-Weiss and Calantone, 1994). No prescribed common criterion can, however, explain how successful new products are created (Poolton and Barclay, 1998). The SAPPHO project (Rothwell et al., 1974), was the first effort to analytically compare commercially successful and unsuccessful products in the same market (Abdel-Kader and Lin, 2009). The conclusions from this project are that successful companies have a much better understanding of customer needs, attend more to marketing and advertising, perform product development more effectively, encourage more use of outside expertise, and authorize and promote responsible and experienced professional employees to senior management levels. Abdel-Kader and Lin (2009) summarize the conclusions of the SAPPHO projects as: Professional employees and good management skills are the key to success. Tang et al. (2005) identified a distinct set of success factors for product development: *Leadership, Organizational culture, Human resources, Information, Product strategy, Project execution, Product delivery, and Results*. Leadership involves key characteristics of the project manager, the power delegated, and whether there is a clear strategic direction for the development project. The Organizational culture involves the extent to which management takes advantage of the established values of the personnel to improve project output. Human resources involve management's actions to improve the skills and the work environment.

Information is concerned with the treatment of information as a valuable asset, its quality, and whether it is systematically collected, shared, and analyzed. Product strategy includes the product planning processes and the extent to which they promote readiness for implementation and product delivery. Product delivery considers to what extent manufacturing, sales, service and support are considered; or whether the product is just "tossed over the wall" when developed. Results evaluate the project from multiple dimensions such as financial and market, customer satisfaction and loyalty, organizational effectiveness, product results, and benchmarking. Further, Bessant and Tidd (2007) argue for the following success factors in product innovation: *Market knowledge, Clear product definition, Product advantage, Project organization, Top management support, Risk assessment, Proficiency in execution, and Project resources*. Product advantage involves product superiority in the eyes of the customer e.g. delivering unique benefits to the user and a high performance-to-cost ratio. Market knowledge, i.e. assessment and understanding of customer and user needs, is critical. A clear product definition, defining target markets, clear concept definition and benefits to be delivered must be determined before the development activities begin. Holistic risk assessment including market-based, technological, manufacturing and design sources must be built into the business and feasibility studies. The use of cross-functional multidisciplinary teams carrying responsibilities is important within the *Project organization* from beginning to end. *Project resources* include financing, human skills, and material resources; the firm must possess the right skills to manage and develop the new product. *Proficiency in execution* includes all the activities of the product innovation process. *Top management support* is important through the complete product innovation process from concept to launch.

Performance Measurements In Product Development : Performance measurements have inspired numerous researchers with functional backgrounds as varied as accounting, operations management, marketing, finance, economics, psychology, and sociology, all actively working in the field (Neely, 2007). This may explain why the common body of knowledge within performance measurements in product development is small, despite the results of a vast amount of research being available. In a recent review of the performance-measurement literature by Taticchi et al. (2010), conclude that four authors within performance measurements are the leading scholars within the field: Kaplan (management accounting), Neely (operations management), Banker (accounting/operations research and information systems), and Charnes (mathematics/operations research). All of the four leading authors have somewhat different disciplinary backgrounds. Neely (2005) concludes, based on a review of the publications within the performance-measurements literature, that performance measurement is not and can never be a field of academic study because of its diversity. In a response to this the same author set out to create a common body of knowledge by editing *Business Performance Measurement* (Neely, 2007). The focus in this common body of knowledge is on the marketing, operations management, management accounting, and supply-chain management functions. Unfortunately, an explicit focus on product development is missing. Jiménez-Zarco et al. (2006) argue that there are few studies that have analyzed the product-development process from a performance-measurement system perspective.

RESEARCH STRATEGY AND METHODOLOGY

I will substantiate the claim in this problem statement by exploring current new product performers that have been considered successes and failures. This will uncover factors that can be considered indicative of an ongoing deficiency in the understanding or awareness of which market research tools are appropriate for utilization during a new product development process. I will then consider what market research tools are available for user/customer integration, examine the most relevant theories for new product development processes available and conclude with an fully

integrated, evolved Stage-Gate process for new product development that will provide specific, substantiated direction for integrating user/customer market research tools. Thus, this will provide the necessary insight for developing a unique, superior product according to users'/customers' perceptions and thereby ensuring the prosperity of the company.

Identifications Of CSFs : The process of new product development has been the focal point of studies and debate for some time now and never has it been more relevant than in the past few years. The advancements in technology and the refinement of development processes have brought about a great number of significant innovations that have changed the way we live our lives from this point forward. As many scholars have suggested and proven, a crucial component to developing successful innovative products and services in integrating the user into the process. Numbers of researchers and industrial expert in the area of NPD has worked with various parameters that play a role in the success of new product.

The dilemma is sometimes figuring out exactly how to initiate and execute integrating all success factors into the innovative process due to the fact that there are so many success factors that one could find difficulty to work with all. As discussed in the previous chapter various factors are being discussed and few critical factors are identified as described in table 3.1.

Table 3.1: Success Factors in New product development

Criteria	Sub-Criteria	Reference
Technical Factor	Technical capabilities	Cooper (1999) Sun and Wing (2005), Poolton and Barclay (1998)
	Product Production in Appropriate Time and cost	Cooper (1999), Sun Lynn et al. (1999) and Wing (2005), Lester (1998)
	Clear definition of the functions of the Product	Cooper (1999) Gupta and Wilemon (1990)
	Technically difficult to replace	Sun Lynn et al. (1999), Lester (1998)
Marketing Factor	Appropriate Marketing strategy	Lester (1998), Haverila(2012), Ernst Holger (2002)
	Focus on the customer	Cooper (1999) Sun, Wing (2005), Haverila (2012),Ernst Holger (2002)
	A growing market	Poolton and Barclay (1998),Ernst Holger (2002) Sharma (2006)
	Clear definition of the target market	Lester (1998), Cooper (1999) Sun and Wing (2005), Ernst Holger (2002)
Organisational Factor	Long-term vision	Cooper (1999) Sun and Wing (2005)
	Different levels of cooperation	Cooper (1999), Haverila (2012), Haverila (2012), Wing (2005)
	Entrepreneurial culture in the Organization	Wing (2005), Poolton and Barclay (1998)
	The time of replacement	Sun Lynn et al. (1999), Lester (1998)
Commercialization Factor	Product Scores than competitors	Sun Lynn et al. (1999),Sharma (2006)
	Resources to implement the Project	Lester (1998), Cooper (1999) Sun and Wing (2005)
	product developed Scores than The old type	Sun Lynn et al. (1999)
	Generating good ideas by Expert Groups	Wing (2005), Haverila(2012), Sun Lynn et al. (1999), Lester (1998)
Social Factor	Cultural competence	Martin et al. (2007)
	Communication	Minaret et al. (2000)
	Global vs. Local	Lahiri et al. (2010)
	Social Responsibility	Haverila(2012), Cooper (1999) Sun and Wing (2005)

QUESTIONNAIRE DESIGN

A total of 54 semi-structured interviews have been held at the selected case companies. An overview and timeline of the perused case studies are performed. The questions asked during the interviews were semi structured where 5 scales are provided in such a way, that the respondents were encouraged to talk about what they thought important from their point of view. The 5 point scale is compromised as; very much important, very important, important, not important and useless. This choice goes from 5 to 1 value in digit. Semi closed questions give answers within a limit and also saves too much time for researchers. Open questions are important in order of not to ask leading questions. The respondents were all managers and decision makers at different levels of responsibility within the research and development in their organization. The interviews lasted between 10 minutes. At first an initial set of respondents were chosen and supplemented with the senior manager representing the company in the steering committee. The focus of the whole thesis is to get the framework and analyse the critical success factors for the new product development.

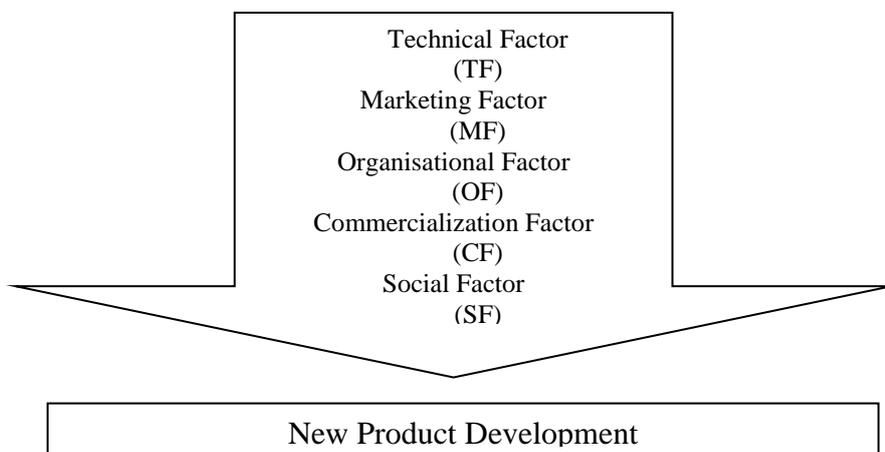


Figure 1: Factors depending on NPD

Reliability of the obtained data is being analysed with the SPSS software and Cronbach’s alpha is found as below in Table 1.

Table 1: Cronbach’s alpha

S. No.	CSFs	Value of Cronbach alpha
1	TF	0.879
2	MF	.739
3	OF	0.935
4	CF	0.856
5	SF	0.92

Results Of Descriptive Statistics : The collected data from survey is initially analyzed with descriptive analysis. Table 2, shows a more detailed statistics of the questionnaires using SPSS program. From the values, in the engineers’ point of view, the most important factors to NPD success in Indian organizations is the role of the top management, topping the table with highest mean score of 3.37 which is in between “very important” and “extremely important”. Next on the rank is the quality of each NPD activities. Nevertheless, Indian companies that stresses on quality. The importance of customer’s opinion comes to play followed by balanced and sufficient resources and so on. On the contrary, building an international orientation of international teams, multi-country market research and global products bottomed the table with only a mean score of 2.90 which was below the “somewhat important” rating and therefore shall be eliminated.

Factors	Mean	Std. Deviation	Factors	Mean	Std. Deviation
TF1	3.0370	1.35929	CF1	3.2222	1.29828
TF2	2.8889	1.56213	CF2	2.8148	1.22973
TF3	3.0000	1.22859	CF3	3.0556	1.37932
TF4	3.1111	1.22346	CF4	3.0370	1.40031
MF1	3.0370	1.38677	SF1	3.3148	1.38488
MF2	2.8889	1.20794	SF2	3.1481	1.26502
MF3	2.8519	1.33752	SF3	3.3704	1.17033
MF4	3.0000	1.42749	SF4	3.1852	1.36083
OF1	3.2037	1.39243			
OF2	3.1481	1.29451			
OF3	3.2222	1.25392			
OF4	2.8889	1.19222			
Valid N (listwise)			54		

RESULTS OF VARIABILITY ANALYSIS

All the values obtained in Table 2, for standard deviation is less than 1. This explained that the ratings vary less than the value of 1 away from the mean. The highest value of standard deviation is 0.988 for the factor "marketing factor" which has the mean score of 3.70. Therefore, the average amount each of the scores for that particular factor varies away from 3.70 is 0.988. On the other hand, the lowest value of standard deviation belongs to the "Role of top management is central to success" under the organisational factor factor with only 0.507. As a conclusion, the amount of dispersion of the set of scores obtained from informants is rather low and therefore, all the data from informants for the questionnaires are valid in the context of variability. Social factor also play the key role having mean value more than 2.5 in all cases. The one-sample t-test has also been used to determine whether a sample comes from a population with a specific mean. This population mean is not always known, but is sometimes hypothesized. For example, organisational factors for marketing peoples learn the actual feedback of the customers. Moving from up-to-down, factors are presented with the observed *t*-value ("*t*" column), the degrees of freedom ("*df*"), and the statistical significance (*p*-value) ("**Sig. (2-tailed)**") of the one-sample t-test. In this example, $p < .05$ (it is $p = .022$). Therefore, it can be concluded that the population means are statistically significantly different. If $p > .05$, the difference between the sample-estimated population mean and the comparison population mean would not be statistically significantly different. Although a statistically significant difference was found between the depression scores in the recruited subjects *vs.* the normal depression score, it does not necessarily mean that the difference encountered, 0.26 (95% CI, 0.04 to 0.51), is enough to be practically significant. Indeed, the researcher might accept that although the difference is statistically significant (and would report this), the difference is not large enough to be practically significant (i.e., the factors can be treated as normal). The sub factors of all technical factors are significant at $p > .05$ similarly all other factors that are significant at two tailed then it can be assumed to be important from the respondents perspectives. All the factors are correlated in the next following sections . further the social factors are more valid and play key role in the success of new product developed in the companies.

Factors	N	Mean	Std. Deviation	Std. Error Mean	Factors	N	Mean	Std. Deviation	Std. Error Mean
TF1	54	3.0370	1.35929	.18498	OF3	54	3.2222	1.25392	.17064
TF2	54	2.8889	1.56213	.21258	OF4	54	2.8889	1.19222	.16224
TF3	54	3.0000	1.22859	.16719	CF1	54	3.2222	1.29828	.17667
TF4	54	3.1111	1.22346	.16649	CF2	54	2.8148	1.22973	.16734
MF1	54	3.0370	1.38677	.18872	CF3	54	3.0556	1.37932	.18770
MF2	54	2.8889	1.20794	.16438	CF4	54	3.0370	1.40031	.19056
MF3	54	2.8519	1.33752	.18201	SF1	54	3.3148	1.38488	.18846
MF4	54	3.0000	1.42749	.19426	SF2	54	3.1481	1.26502	.17215
OF1	54	3.2037	1.39243	.18949	SF3	54	3.3704	1.17033	.15926
OF2	54	3.1481	1.29451	.17616	SF4	54	3.1852	1.36083	.18519

CRITICAL SUCCESS FACTORS

Table 4, analyses the detailed descriptive analysis for the data collected from the respondents on their views for the identified critical success factors for NPD in the respondents companies. The maximum and minimum values indicate the values taken for Likert scale data that ranges from 1 to 5 from very important to no important. The mean values indicate leanness of respondents towards a particular values and this values indicate in maximum case above the average (2.5). Further the standard deviations values indicate the nearness from standard. At last the variance indicates the actual variation of respondent's opinion from the mean values which are assumed and indicated by maximum numbers of respondents.

Table 4, shows a more detailed statistics of the questionnaires using SPSS program. From the values, in the engineers' point of view, the most important factors to NPD success in Indian SMEs is the role of the top management and social factor, topping the table with highest mean score of 3.31 which is in between "very important" and "extremely important". Next on the rank is the quality of each NPD activities.

As a summary from the table of descriptive statistics (Table 2), the top critical success factors of NPD in Indian organization according to the engineers and their mean scores as followed.

- (1) Role of top management is central to success (Accountability, commitment, involvement and leadership) (Mean 3.11).
- (2) High quality on execution of all activities (Mean 3.22).
- (3) Focus on customers – built-in opinion of the customers (Mean 3.3).
- (4) Senior management's strong support and empowerment to teams with a flat organization structure (Mean 3.07).
- (5) Organize around true cross-functional teams with strong accountable, dedicated and focused project leader (Mean 3.03).
- (6) Balanced, sufficient resources for number of projects (Mean 3.03).
- (7) Rewards and recognition to teams (Mean 3.0).
- (8) Development and launching of products within the proper time frame (Mean 3.97).
- (9) High-quality NPD teams (Mean 3.93).
- (10) Retaining team members with relevant experience (Mean 3.90).

CONCLUSION

Having the knowledge and right selection of CSFs can secure a smooth transfer of the new products into the production phase to the market and customer. The objective of the present research work fulfills while identifying the CSFs for NPD in Indian companies. The new products internally are anytime better but also other critical factors that affect its success is being identified and analyzed. In depth analysis shows that also there are a few other benefits of having CSFs measure in the company. CSFs improve coordination of the supply chain and leads to expansion of core companies. CSFs also capture both upstream and downstream opportunities of NPD in the increase of barriers of entry by potential competitors having mean values 3.83 and positive correlation with other factors.

Perhaps, these CSFs are specific to Indian companies and not for other companies, since not all companies practice all kind of CSFs. As a conclusion, selected CSFs are one of the many reasons for NPD success in Indian companies but

might not be a general critical success factor of NPD worldwide. The role of management factor has the highest mean score of .47 and the lowest variance of 0.257 among all the factors tested. In the perception of the engineers in Indian companies, the role of management is the most important and central to NPD success. The role of management here refers to the overall leadership of the top management including their accountability, commitment and involvement towards NPD process. Thus, from the NPD beginning, analyses and screenings within the areas of Production, Engineering, R&D (develops technology to be incorporated into the product) and Commercial, will be intensified and concentrated on the product to be developed. Integration of Selected Technical, commercial, organisational, marketing and social factors can be deemed as an important management mechanism, since the multifunctional factor consideration boosts the accumulated knowledge exchange, in the success of NPD in all the way. Integration of factors also diminishes uncertainties and consequently increases decisions quality as made during the beginning of the development; this is likely to lower NPD cost due to the probable reduction of problems occurrence throughout the NPD process. That type of organizational arrangements for product developments can be implemented more easily in small and medium companies, as those object of this research; due to their size, and inter-functional communication, the organizational arrangement tends to occur more naturally. It is a management mechanism to be better explored by the small and medium size companies in the Indian industrial sector.

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