

Full Length Research Paper

Critical success factors of new product development in technology based firms: A case study

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In today's advanced technological era, new products are emerging rapidly and market competition is increasing. It is important for Malaysian companies to invest more in research and development (R and D) and to develop their own design capabilities and innovative products. New product development (NPD) refers to the complete process of bringing a new product or service to the market. The quest has been going on for decades to find the answer why some businesses are so much more successful at NPD as compared to the rest. That leads to the main theme of this paper which is the critical success factors (CSFs) of NPD. This case study is based on a company in Malaysia to explore the CSFs of NPD in a technology-based company. A survey utilizing the means of interview and questionnaire were conducted to discover the factors that are important to the NPD success. The company's strengths and weaknesses that affect NPD performance were also explored. Support with the interview results from the engineers, the role of top management is the most critical factor that leads to NPD success. As a result of the research, an adapted model of CSFs of NPD for the company was developed. Finally, the study provides discussion of the implications and recommendations for both researchers and managers in the area of NPD management.

Key words: New product development, critical success factor, new product introduction, product life cycle.

INTRODUCTION

Globalization has increased the competition in the marketplace. Consumers are given a wide choice of products and services, with lower prices and better quality. Adding to that, the demand for new, better and cheaper products and services makes it hazardous, difficult and expensive to stay ahead of the race. To stay ahead of increasing competition, innovators are now working on the development of an ecosystem of new products. New product development (NPD) process has always been a vital part of an organization's business practices. NPD is a main driving force of a firm's competitiveness. Driven by the globalization of markets,

technological advances and ever-changing customer needs, product innovation is now the number one plank in many companies' tactical platforms (Cooper, 2000).

The purpose of the NPD process is to generate a stream of market led, technically and commercially viable new products to support the business plan, with minimum risk, and where products and processes are both safe and environmentally friendly ((Cooper, 2000; Yip et al., 2006). New products are introduced to increase sales and profits as well as competitive strength for firms.

NPD has become a major concern in all companies and its success is undeniably vital to the viability, growth and prosperity, especially in today's modern corporation. The successful development of the "right" product and/or service will contribute to the firm's continued growth and success. Firms need to create and sustain competitive advantages to survive in today's highly competitive

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business environment (Porter, 1985). The performance of a firm is based on its competitive advantage over other firms and its sustainability.

One major cause of the firm's sustainability is the consistent and successful development of new products. It was stated by Barclay et al. (2000) that the ability to produce a steady flow of successful new products consistently is the key factors in corporate success.

The main objective of this paper is to explore and identify the critical success factors of new product development in ESCATEC Corporation, Penang, Malaysia. Other objectives of this research include: to investigate the factors of NPD failures in ESCATEC corporation as well as to make some recommendations on the improvement on the company's NPD process.

This paper is outlined as follows: Subsequently, the study lays out the literature review. Afterwards the study presents the methodology of the analysis, followed by the study findings and discussion and the study was then concluded.

LITERATURE REVIEW

New product development (NPD)

New product development (NPD), as the term goes is the development of new products. In some firms, NPD is regarded as product innovation and product commercialization. The term new product development is all embracing and ranges from products that are totally new to the world to minor modifications (Barclay et al., 2000). Due to the involvement of several different activities, NPD has become a complicated and time consuming process. Rosenthal (1992) had defined NPD process in terms of several distinct phases:

Phase 1: Idea generation and conceptual design.

Phase 2: Definition and specification.

Phase 3: Prototype and development.

Phase 4: Commercialization.

The whole process in the foregoing should be a balance of individual and cross-functional activities. Hence, it is very important to understand the definition and management of the four phases. The development of new products is necessary to maintain a healthy organization and can be rewarding although the introduction of new product is risky (Urban et al., 1987; Ismail, 2011a, c).

In the United States, almost half of CEOs rate product innovation or NPD as "very critical" to their future business success, according to a Cheskin and Fitch (2003) global study. NPD is crucial to the prosperity of the modern corporations. Brown and Eisenhardt (1995) stated that both academicians and practitioners acknowledge that NPD is a critical process to most firms

to be able to survive a long-term and for business growth. Since the mid-1950s, there have been a large and continual number of studies probing into the factors of success and/or failure for NPD with more than 200 studies carried out in various industries, geographical settings, and also with various methodological approaches; all sharing the same objective (Jensen and Harmsen, 2001).

Product innovation is fundamental to an organization's ability to move itself forward. Without effective product innovation, an organization will stagnate and rapidly lose its competitive edge (Bender et al., 2000). Despite all the foregoing, the question lies within the reasons why NPD is important in business and an important field of study.

Critical success factors (CSFs) for new product development (NPD)

Variety of factors contributes to the success of NPD in any firm, and these will be reviewed in this research. As mentioned by Montoya-Weiss and Calatone (1994), previous empirical research on new product performance has provided considerable evidence that a wide variety of antecedent factors can influence the outcomes of new product development process. Barclay et al. (2000) gave the opinion that NPD is a 'tailored' process; "a company's development environment is unique to that company", therefore, NPD processes have to be 'tailored' to suit the specific circumstances.

However, Yodhia Antariksa stated on his website that an investigation of new product practices in 700 Fortune 1000 firms has identified the existence of common characteristic in those that were successful in NPD.

The common factors in NPD success are across high-productivity, best performers in NPD were revealed in a recent major American Productivity and Quality Centre (APQC) study (Cooper, 2005). A model called the Innovation Diamond was produced as illustrated in Figure 1. The Four Points of Performance in the Innovation Diamond or the four main factors that drive NPD performance results are based on the APQC study into NPD best practices headed by Cooper (2005). According to Cooper in the study, there is no easy way to success in NPD, therefore managers need to step back and look at the broader picture. The four success factors are: product innovation and technology strategy, resource commitment focusing on the right projects, effective and flexible streamlined idea-to-launch system and the right climate and culture for innovation, true cross-functional teams, and senior management commitment.

Previous studies

The success of companies was found to be as a result of their proficiency in NPD. Poolton and Barclay (1998)



Figure 1. Innovation diamond. Source: APQC study (Cooper, 2005).

posited that “if companies can improve their effectiveness at launching new products, they can double their bottom line. It’s one of the areas left with the greatest potential for improvement.” Many studies have focused on success or failure of NPD associated with CSFs. A selection of such studies are reviewed and summarized in Table 1.

Research framework

Figure 2 illustrates the research framework for this study with the purpose of exploring the success and failure of NPD. ESCATEC’s NPD is being explored in terms of product success and failure rate. As we can see from the framework, the research focuses on the critical success factors (CSFs) which contribute to the successful commercialization (Ismail et al., 2011d, 2012) of new products.

The CSFs of NPD in ESCATEC in the employees (engineers) point of view are explored based on the 5 dimensions listed. The dimensions and factors included in this research are adopted from past researches by Cooper (2000, 2005), Cooper and Edgett (2006), Cooper et al. (2001), Cooper and Kleinschmidt (2007) and Lynn et al. (1999). This paper also explores into the strengths, failure, weaknesses and challenges faced by the company in terms of NPD.

METHODOLOGY

This research was conducted at ESCATEC in Penang, Malaysia. The ESCATEC Group stands out as a world-class company with a full range of electronic and mechatronic design, and manufacturing services. A total of 30 copies of the questionnaires were sent to ESCATEC. The intended informants were those managers and engineers involved in NPD. Of these 30 questionnaires, 50% were answered by Head of Departments, 17% by Senior Engineers, 17% by KAE’s, 10% by Section Heads, 3% by Engineers and 3% by Junior Engineers. *F*-test of all the variables controlled by the

respondents was conducted to ensure there was no bias from any group of respondents.

The questionnaire was prepared and divided into two parts based upon the CSFs identified by previous researchers. All the possible CSFs were allocated to each of the five dimensions. The first part enquired about basic information concerning the respondent such as involvement in the new product development, working experience, job position and the nature of the product being developed. The second part asked about the importance of each CSF among five dimensions of product development.

Interview session with the head of R and D department was conducted for information to measure the extent of implementation of the CSF. Data were analysed using both qualitative and quantitative method. Questionnaires were analysed using descriptive statistics aided with SPSS software. Interview data were analysed using case by case analysis as proposed by Yin (1994, 2003). To test the reliability of the success factors, Cronbach’s alpha is used. It was suggested by Nunnally (1978) that constants have the reliability values of 0.7 or greater. Hence, factors that yield values less than 0.7 fail the reliability test and therefore, is unreliable.

DATA ANALYSIS AND RESULTS

Findings of interview

The interview results were divided into a few themes, firstly, the NPD background of ESCATEC. Secondly, success of NPD in ESCATEC and lastly, the weaknesses and challenges faced by ESCATEC.

ESCATEC’s NPD background

Swiss-owned company founded in 1974, with world-wide branches. ESCATEC Group has more than 35 years of contract manufacturing facilities with tool making and plastic molding and sales support services. The company is located in Europe and Asia. The Company’s branch in Penang, Malaysia was chosen in this case study. On the

Table 1. CSFs for NPD identified by previous researchers.

References	CSFs
Cooper and Kleinschmidt (2007)	<p>A high-quality new product process that demanded up-front homework, sharp and early product definition, tough Go/Kill decision points, and quality of execution, thoroughly, yet flexible.</p> <p>A defined new product strategy with new product goals, delineated areas of focus, new product roles clearly communicated, all with a long-term thrust.</p> <p>Adequate resources of people and money</p> <p>R and D spending for NPD (as a % of sales) – by far the strongest determinant of the impact of the NPD effort.</p> <p>High-quality new product project teams</p> <p>Senior management commitment and involvement</p> <p>An innovative climate and culture</p> <p>The use of cross-functional project teams</p> <p>Senior management accountability for new product results.</p> <p>Customer focused</p>
Cooper (2005)	<p>Front-end loaded – an emphasis on homework prior to development</p> <p>Develop products superior to competitors</p> <p>Excellent quality of execution</p> <p>Tough, rigorous Go/Kill decision points</p> <p>NPD performance metrics (e.g. Net present value, sales, on-time launch)</p> <p>A Process Manager to lead the process</p>
Bender et al. (2000) Lynn et al. (1999)	<p>High-quality vision</p> <p>Adequate funding and aggressive deadlines (time factor)</p> <p>Teaming factors (skills, experience, stability)</p> <p>Information storage and processing</p> <p>Having a structured new product development process</p> <p>Having a clear and shared vision on the team</p> <p>Development NPD process</p> <p>Development and launching a product within the proper time frame</p> <p>Refining a product after launch and having a long-term view</p> <p>Possessing the optimal team skills</p> <p>Understanding the market and its dynamics</p> <p>Securing top management support for the team and the team's vision</p> <p>Applying lessons learned from past projects</p> <p>Securing good team chemistry</p> <p>Retaining team members with relevant experience</p>

average, ESCATEC launched 3 to 4 products in a year and the average product life of their products are 3 to 5 years. All the products that are developed in ESCATEC succeeded to enter the commercial market.

Some products might have some delays due to the change management from customers but there are no records of product failure in the recent years. Being a high-technology based company in the various industries; ESCATEC's industry in terms of product innovation is fast changing with high competition.

However, among all its competitors, ESCATEC is outstanding because of its product quality and its vertical integration. ESCATEC's Head of R and D has the opinion

that vertical integration is the main reason why ESCATEC is doing better than others. ESCATEC is not just a design house but it also does the manufacturing for its customers.

ESCATEC's CSFs and strengths

ESCATEC NPI process follows a simple phase model as illustrated in Figure 3. It divides project into phases, so that the extra risks inherent in taking one large step is avoided by splitting it into a several easy assessed smaller steps (ESCATEC Sdn. Bhd., 2005).



Figure 2. Research framework (NPD in ESCATEC, 2005).

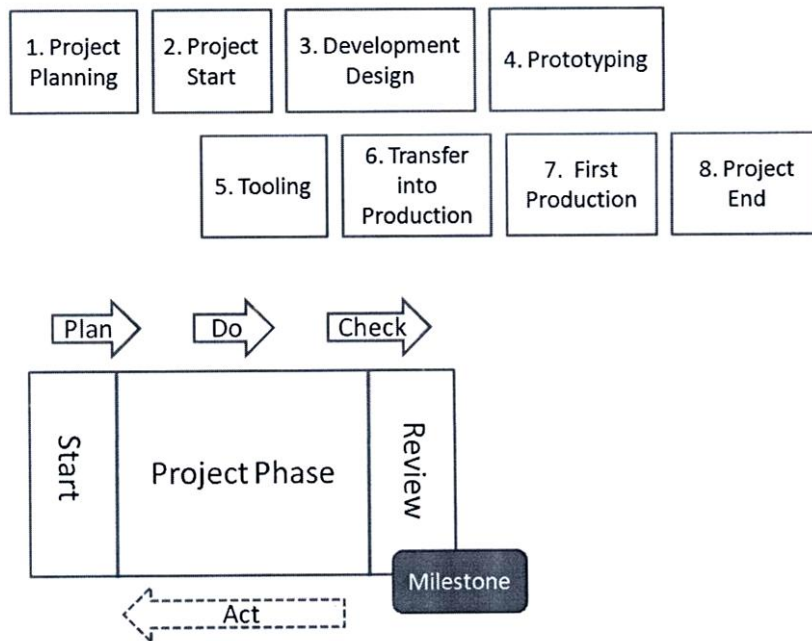


Figure 3. Phase Model for NPI. Process (Source: ESCATEC Sdn. Bhd., 2005).

The intermediate results can be inspected after each of these steps. Such a procedure improves control and confidence throughout the entire project. This structure is similar to the Deming cycle. The Deming cycle used to improve quality is a continuous loop consisting of the Plan, Do, Check and Act (PDCA) steps (Case, 2007). Due to the simplicity of the process, the model is adaptable to any type of project.

The effort to lock-in customers is important as is the focus on building-in the voice of the customer. In

ESCATEC, responsibility to get customers lies on the hand of the business development team. Besides being vertically integrated, ESCATEC has conceptual ideas to commercialize which manage to lock-in customers. Having more customers mean more projects and more production; more production means more profit and more resources and successes in NPD.

ESCATEC has a proper workbench on new products and also for R and D purposes. According to the interviewee, ESCATEC spends 30% (as a percentage of

sales) on R and D expenses for NPD and agreed that R and D spending for NPD is somewhat important to the NPD success in the company.

Another issue raised in the interview is the role of top management. ESCATEC emphasizes on the role of top management giving strong support with proper and good monitoring through leadership. It was agreed that the top management is very important and commented that ESCATEC's top management is doing a great job and being a Swiss-managed company has contributed to the success of NPD.

The interviewee explained that in ESCATEC, engineers are given high responsibility and empowerment to make decisions but they are frequently monitored having to report to the head of department or section.

In the R and D department, frequent meetings are being held to assess progression of projects. Top management must lead the way in NPD by providing both the leadership and commitment of the necessary resources (Cooper and Edgett, 2003). Apart from having commitment and good top management, ESCATEC claimed that their new product project teams are strong and this factor is vital to the success of NPD in the company.

One important characteristic (Cooper, 2005) was also seen in this company, and that is the existence of coordinating groups which provide a more flat organization. ESCATEC has a flat organization with three to four levels which allow decentralized decision making. Having less layers in the hierarchy with a flat structure can also be a factor to success.

Flat organization can lead to a more efficient decision making. Apart from that, organizing around true cross-functional project teams is important to have an effective management and tremendously contributes to the success of NPD. However, the cross-functional organization occurs as a challenge to ESCATEC.

ESCATEC's weaknesses and challenges

Change management by customer is a critical factor to NPD failure. ESCATEC's design and development are based on the needs and wants of the customers and customer's requirements might change at any time without prior notice or warning. Project that faces such problems might be totally scrapped off or cause a delay in development process, therefore launching of the product is delayed and might just be the reason to new product failures.

It was also commented that the strategies developed in ESCATEC might not be strong enough in terms of NPD, where the vision of the company does not have enough support towards the company's NPD.

Perhaps some of the projects are not aligned with its business vision and strategy. This is one of the weaknesses of ESCATEC from the NPD point of view

and can be a challenge to the company.

Besides that, ESCATEC has been more of a follower than a leader where technology is concerned. ESCATEC is a company with not much invention and not a technical leader therefore is dependent on existing technology. Being a follower caused ESCATEC to lose the advantages of being the first-mover for example having unique opportunity to create barriers and a competitive advantage.

Findings from survey

The data and following information are findings obtained from the survey of questionnaires contributed by 30 engineers from ESCATEC.

Results of descriptive statistics

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 ESCATEC is the role of the top management, topping the table with highest mean score of 4.47 which is in between "very important" and "extremely important". Next on the rank is the quality of each NPD activities.

Nevertheless, ESCATEC is a company 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. Those below score of 3.50 shall also be considered to be excluded in the list of CSFs.

Results of variability analysis

All the values obtained in Table 4 for standard deviation are 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 "Attack from a position of strength" 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" 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.

Critical success factors

As a summary from the table of descriptive statistics (Table 4), the top 10 critical success factors of NPD in ESCATEC according to the engineers and their mean scores as followed.

- (1) Role of top management is central to success (Strong accountability, commitment, involvement and leadership) (Mean 4.47).
- (2) High quality on execution of all activities (Mean 4.37).
- (3) Focus on customers – built-in opinion of the customers (Mean 4.3).
- (4) Senior management's strong support and empowerment to teams with a flat organization structure (Mean 4.07).
- (5) Organize around true cross-functional project teams with strong accountable, dedicated and focused project leader (Mean 4.03).
- (6) Balanced, sufficient resources for number of projects (Mean 4.03).
- (7) Rewards and recognition to teams (Mean 4.0).
- (8) Development and launching of products within the proper time frame (Mean 3.97).
- (9) High-quality NP project teams (Mean 3.93).
- (10) Retaining team members with relevant experience (Mean 3.90).

DISCUSSION

The vertical integration factor

Having vertical integration can secure a smooth transfer of the products into the production phase. Transfer of products internally is anytime better than transferring products from one company to another. Referring to the literature review on NPD in ESCATEC, it was reported that the various alternative manufacturing locations are one of ESCATEC's competitive advantages where the project team evaluates products to select the suitable location and does a smooth internal transfer (Perunovic, 2008).

There are a few other benefits of having vertical integration in the company. Vertical integration potentially improves coordination of the supply chain and leads to expansion of core companies. Vertical integration also captures both upstream and downstream profit margins and provides more opportunities of differentiation having increased control over inputs resulting in the increase of barriers of entry by potential competitors (Yeung, 2006).

Perhaps, this is a factor that is specific to ESCATEC and not for other companies, since not all companies practice vertical integration. As suggested by Barclay et al. (2000), NPD is a "tailored" process; "a company's development environment is unique to that company". In this case, vertical integration is a "company-specific" success factor.

As a conclusion, vertical integration is one of the many reasons for NPD success in ESCATEC but might not be a general critical success factor of NPD.

Critical success factors (CSFs)

The role of top management

The role of top management factor has the highest mean score of 4.47 and the lowest variance of 0.257 among all the factors tested. In the perception of the engineers in ESCATEC, the role of top management is the most important and central to NPD success. The role of top management here refers to the overall leadership of the top management including their accountability, commitment and involvement towards NPD process.

In any job or task that involves a team, leadership is the foremost important criteria to ensure success and effectiveness. Leaders have the responsibility and also the strongest influence and power to motivate, facilitate, direct, monitor and guide. Behavior of the top management will also affect how the lower level employees behave. This can be explained by the so-called "Leadership through example" or paternalism leadership style of influencing. One possible reason why this factor topped the list that we can see was because of the culture of people in Malaysia that displays high power distance. Power distance, one of the dimensions suggested by Hofstede, refers to level of acceptance of unequal distribution of power. In high power distance countries, employees acknowledge the authority of boss out of respect to position in the hierarchy. Therefore, in most companies in Malaysia, the top management gets the respect of their position and can freely exercise their authority and lead the company according to their preferred leadership style. Being a Swiss-managed company, ESCATEC's management style might differ with other companies in Malaysia.

Other CSFs

Factor that falls after the role of top management is the high quality on execution of all activities. No doubt, ESCATEC has been keen on upholding its reputation for quality with certified quality systems and firm-wide best practices of quality.

As the saying goes "customers always come first", engineers in ESCATEC have the opinion that to build-in opinions of customers is one of the most critical success factors of NPD. This factor has been repetitively stressed by Cooper in numerous articles. Apart from the top 10 critical success factors, there are other factors that significantly contribute to NPD success (Table 2).

Challenges

It was commented that maintaining the cross-functional

Table 2. Descriptive statistics.

S/N	Success factors	Mean	Min	Max	SD	Variance
1.	Role of top management is central to success (C10)	4.47	4	5	0.507	0.257
2.	High quality on execution of all activities (S4)	4.37	3	5	0.615	0.378
3.	Focus on customer – build-in voice of the customer (S1)	4.30	3	5	0.651	0.424
4.	Senior management’s strong support and empowerment to teams with a flat organization structure (C1)	4.07	3	5	0.740	0.547
5.	Organize around true cross-functional project teams with strong accountable, dedicated and focused project leader (C6)	4.03	3	5	0.587	0.345
6.	Balanced, sufficient resources for number of projects (R6)	4.03	2	5	0.809	0.654
7.	Rewards and recognition to teams (C5)	4.00	2	5	0.947	0.897
8.	Development and launching of product within the proper time frame (S9)	3.97	2	5	0.718	0.516
9.	High-quality NP project teams (C7)	3.93	3	5	0.640	0.409
10.	Retaining team members with relevant experience (C9)	3.90	3	5	0.662	0.438
11.	Front-end loaded – up-front homework prior to development (S2)	3.90	2	5	0.803	0.645
12.	Ranking and prioritizing projects (R5)	3.90	2	5	0.759	0.676
13.	Projects are aligned with business’s strategy (R4)	3.87	2	5	0.776	0.602
14.	Right balance of projects (R3)	3.87	2	5	0.900	0.809
15.	Develop products superior to competitors-product differentiation (S3)	3.83	3	5	0.834	0.695
16.	Business’s climate that supports entrepreneurship and innovation (C3)	3.80	2	5	0.997	0.993
17.	Clearly defined new product development goals (T1)	3.80	3	5	0.610	0.372
18.	A well-planned, adequately resourced and proficiently-executed launch (S8)	3.77	3	5	0.728	0.530
19.	Utilizing strategic bucket (T5)	3.73	2	5	0.868	0.754
20.	Having a clear and shared vision on the team (P3)	3.73	3	5	0.691	0.478
21.	Understanding the market and its dynamics (P2)	3.70	2	5	0.750	0.562
22.	Having a process manager to lead the process (S7)	3.70	3	5	0.651	0.424
23.	Attack from a position of strength (T3)	3.70	2	5	0.988	0.976
24.	Sharp, stable and early product definition before development begins (P1)	3.67	2	5	0.606	0.368
25.	New product metrics being part of annual objectives (C2)	3.63	2	5	0.718	0.516
26.	Strategic arenas defined (T2)	3.63	3	5	0.615	0.378
27.	Tough go / kill decision – to have funnels and not tunnels (S5)	3.53	3	5	0.629	0.395
28.	R and D spending for NPD (R1)	3.50	2	5	0.951	0.904
29.	New product project metrics built in to gauge performance of projects (S6)	3.40	3	4	0.498	0.821
30.	Company gives time-off for creative work by employees (C4)	3.13	0	4	0.986	0.972
31.	Formal and systematic portfolio management system (R2)	3.07	2	5	0.679	0.461
32.	Strategy on mapping out of attack plans with product roadmap (T4)	3.03	1	4	0.809	0.654
33.	Build an international orientation (C8)	2.90	1	4	0.923	0.852

or matrix organization is a challenge. Although, the cross-functional structure requires cooperation between functional group and project team, it does not always happen; complication as well as miscommunication often arises. The reason behind this is the lacking of a teamwork culture in an organization, as supported by Huffmier and Holmes (2006).

ESCATEC also faced the customer's change management on the product that is developed. As mentioned, project that faced such problems might be delayed in development and subsequently delay the launching of the product. Moving on to the factor of strategizing, it was also commented that business strategies developed in ESCATEC might not be strong enough in terms of NPD. This happens to be a challenge to the company.

Revised model of critical success factors

After analyzing the findings of the survey, the model of critical success factors of NPD in ESCATEC is revised. Figure 4 depicts the revised model of this study and the factors are arranged according to its importance with the most important on the top dimension. Those factors which are text-bold are in the top 10 list (Table 2) and those insignificant factors are being eliminated.

LIMITATIONS

This research is a case study that focuses only on one company which is ESCATEC Sdn. Bhd. an SME in electronic industry. Since the survey is carried out in this company, the findings might be biased towards the culture and perception of the management of the company. This research has limited resource of information as it depends on the availability of employees of the company. Moreover, the company has a small NPD team with only 29 engineers that are involved in NPD process. Lastly, the findings of this research are limited in terms of honesty and understanding of informants in interview and also in answering questionnaires. Engineers in ESCATEC might or might not be experienced enough in NPD process to provide information effectively.

RECOMMENDATIONS AND SUGGESTIONS

Article by Cooper (1998) on "Benchmarking New Product Performance: Results of the Best Practices Study" suggested some prescriptions for management. If NPD success becomes unfavorable, the NPD process should undergo an overhaul. An overhaul process shall be carried out based on a systematic product road-map, moving the process through various stages and steps

from idea to product launch (Cooper, 1998). ESCATEC can perhaps revise its aligning projects with its business tactics to make sure it supports the NPD process. At the same time, a new product strategy should be revised according to the points suggested by Cooper: having clear goals in NPD efforts, a clear link of NPD efforts to company's business goals and strategy and have a longer term product innovation thrust.

It is tremendously important to have adequate and appropriate resources of both money and people. Therefore, ESCATEC should put more effort formulating retention strategies to retain its employees especially those who perform well, are knowledgeable and experienced. After all, involving in design of NPD process is one of the best practices of top management (Cooper and Edgett, 2003). All employees are encouraged to participate actively in NPD decision making.

Cooper and Edgett (2003) suggested some ways to have more effective teams which are encouraging, more frequent communications among members in the team by having more update meetings periodically to review updates and problem solving; stop frequent change of project leader; assign project leaders to be responsible only to specific projects so that they are dedicated to only one job. Project leaders should be made aware of Robert Yourzak's top 10 motivators and de-motivators which was presented in a chapter of "Field Guide to Project Management", edited by Cleland (2004).

In future, in-depth research focusing on one or two of critical success factors of NPD (for example the role of top management or portfolio management) and more detailed study on how it affects the NPD performance can also be attempted. In the study, the emerging theme or factor of vertical integration has been identified as one of the success factors of NPD for the company. An in-depth research on this particular factor can be explored to a better understanding and to prove its influence towards NPD success. Also, the Swiss management style can be further studied in depth.

conclusions

From this case study, the hypotheses have been tested and it can be concluded that there is indeed a significant importance and effect of a particular critical factor to the success of NPD in an organization. In the recent past, all new products that were developed in ESCATEC have been successful in the market which is a great accomplishment.

In the findings of this research, a new factor that contributes to the success of NPD has been discovered. The vertical integration has helped ESCATEC to outdo its competitors. However, due to the lack of support and past literature relating to this factor, it was concluded that vertical integration is one of many reasons to NPD success factor. In fact, this factor significantly influences

the competitiveness of company more than it does for NPD success.

Conclusively, this research further supports that NPD is extremely important to a company's survival in this competitive business world and there are some common critical success factors that influence the success factors of NPD.

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