IDENTIFICATION OF FACTORS AND DEVELOPMENT OF FRAMEWORK FOR RESOURCE MANAGEMENT OF NEW PRODUCT DEVELOPMENT IN INDIAN AUTOMOBILE INDUSTRIES

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ABSTRACT

New Product development management has been a major component of competitive strategy to enhance organizational productivity and profitability. There exists a competitive pressure that enriches the level of quality products in auto industry. Processes are being streamlined and automated for higher productivity on quality, delivery time and cost. Industries are shifting away from rigid and preplanned activities to quick response to changes. There exist human resource impact on the competitive advantage of new product development management - for speed, for creating an enhanced environment to an interactive role and for breaking the barriers on increasing reliability and dependability of new product & development. The lateral and proactive thinking approach in human resource has to be identified, provoked and nurtured towards new product development activities. There is certain amount of Human Resource role in developing performance based culture for new product. It is to be made sure of ensuring right talent at the right time for driving the culture for new product development.

Key Words: New product development, Automobile industry, Advanced Product Quality Planning, factors, factors frame work
INTRODUCTION

The response to competitive pressure to meet the customer expectations has become the main focus for Indian automobile industries. Generally it is usually easier to say no than yes. But in product development the opposite is more likely true — it’s hard to turn down a major customer asking you to add more features to your product or asking you a new model product. [1] Despite substantial prior research on new product success, there are still high failure rates. [2]. With these changes, companies are looking for ways to better plan and control their operations. They are shifting away from a company with rigid and preplanned activities to one that is able to react quickly and appropriately to changes. [3]. Improving performance in new product development has become one of the critical issues for gaining competitive advantages for companies. [4].

In order to operate efficiently, the design, development, testing, purchase, quality, manufacturing, plant engineering, finance and human resource functions must operate in an integrated manner. Providing quick and quality responses to new product development events requires the coordination of multiple functions across the enterprise. [3]. Global competition, rapidly changing technology and shorter product life cycles have contributed to making the current manufacturing environment an extremely competitive one. Innovation in product and process development is regarded as a key avenue for growth, profitability and competitive advantage in many industries. The supply chain capabilities is a firm’s ability to build, integrate, and reconfigure its upstream supply chain, internal operations, and downstream supply chain to address rapidly changing market needs.

To enhance the performance in new product development one of the ways may be a refinement in the induction of people for new product development. An appropriate identification and understanding of the critical factors in selection of Human resource for new product development will enhance quality, cost and delivery of the product built.

AUTOMOTIVE INDUSTRY IN INDIA

The Automotive industry in India is one of the largest in the world and one of the fastest growing globally. India manufactures over 11 million vehicles (including 2 wheeled and 4 wheeled) and exports about 1.5 million every year. It is the world's second largest manufacturer of motorcycles, with annual sales exceeding 8.5 million in 2009. India's passenger car and commercial vehicle manufacturing industry is the seventh largest in the world. India is the second fastest growing automobile market in the world. According to the Society of Indian Automobile Manufacturers, annual car sales are projected to increase up to 5 million vehicles by 2015 and more than 9 million by 2020. By 2050, the country is expected to top the world in car volumes with approximately 611 million vehicles on the nation's roads.

PURPOSE OF THE STUDY

The study is to understand the critical factors for the professionals getting selected for new product development team. By focusing on the critical factors, companies will be able to develop their plans and structure themselves to the dynamically changing pace of innovation and learning in automobile original equipment manufacturer (OEM).
DEMAND EXISTS
Managing the company's talent needs is as critical and equivalent to managing the new product development says Wharton management professor Peter Cappelli. Yet the majority of employers have bad track records on retaining talent. [5].

SCOPE OF THE STUDY
The scope of the new product development in shown in Fig.1. The automobile industry in India works with the base from its experience and also has got enhanced from Advanced Product Quality Planning (APQP) and its related systems. This system APQP had been framed by Ford, Chrysler and General Motors. The flow in the figure below shows the generally followed new product development flow and also has been aligned with APQP stages. To be more specific, it is in this scope of study it had been planned to list out the factors that are critical for the development professionals to possess (basically techno commercials).

A General flow of New Product Development aligned with Advanced Product Quality Planning Sequence

![Fig 1. A General flow of New Product Development aligned with Advanced Product Quality Planning Sequence](image)

NEW PRODUCT DEVELOPMENT PROFESSIONALS
The new product development professionals are the one who are supposed to possess multi faceted traits by which the organisation gets the benefit of demonstrating its capabilities to the external world including their competitors, of the skill of being close to their customer by the development of new and unique featured automobile products they were dreaming within them.

SIGNIFICANCE OF THE STUDY
In today’s environment where there exists a situation where the “change” is anticipated and accepted in any field, the automobile OEMs had been gearing up for a rapid growth for which they have relied and relying upon human resource - the right human resource at the right time. The study attempts to identify the key factors that will be, when identified for its presence and level in an engineering professionals, during the induction into new product development team, will enable an organisation to get identified separately from competition.
The New product development in automobile OEMs demands for real and sustainable competencies and growth. This is essential to ensure they are not pushed back in the competition of offering the unimaginable, delightful, innovative features for the customers [2].

LITERATURE SURVEY AND ANALYSIS
Important factors that were noticed in the survey report are listed below:
- Technical and commercial skill
- Communication and Interpersonal skill
- Innovative and positive lateral thinking
- Team and cross functional working
- Leadership and supplier management

Also a detailed study on theoretical base has been done to have the backup for the research ensuring support and enhancement to the outcome.

DEFINITION OF CRITICAL FACTOR
Any of the aspects of a business that are identified as vital for successful targets to be reached and maintained may be critical factors. Critical factors are usually identified in such areas as production processes, employee and organization skills, functions, techniques, and technologies. The identification and strengthening of such factors may be similar to identifying core competences, and is considered an essential element in achieving and maintaining competitive advantage

QUALITY IN ENGINEERS
To manage the new product developmental activities we need engineers who need an idiosyncratic attitude. Apart from their basic qualification and their experience, when they come for handling the new product development, it calls for set of factors. These factors are inbuilt in engineers, bringing them out is the focus.

LITERATURE REVIEW AND THEORY BASE
Literature review had been done to understand the current premise that the development professionals working for new product development in an automobile industry induction is a network of decisions. The choice of factors yet been defined for high concert output in developing automobile.

An earnest search for factors, set of connections between factors and a search of those factors during the induction of development engineers was completed. Independently the factor’s significance has been elaborated, but its associations and putting into practice for induction gone astray. In literature survey copious journals have been referred to understand the various factors that have role to play in new product development professionals.

New product development requires a collaborative approach for managing the NPD process and everyone involved. Development of a new product involves commitment on the part of management and all the participants. Contributors to the NPD process must have patience and perseverance to succeed. The cross functional team is the typical
structure since it facilitates participation on a concurrent basis. [6]. There is a wide recognition on the importance of overall timing in the new product development and commercialization processes. Reducing cycle time and first to market in NPD and commercialization is key to innovation success and profitability. [7].

Takeyuki Tani explains the importance of technical and commercial skills in development engineer working for new product development. Target cost management is concerned with simultaneously achieving a target cost alongside the planning, development and detailed design of new products by using methods such as value engineering. [8]. The basic premise of sustainable business development from a technology perspective is that leading change involves proactive development of new technologies, improving existing ones, creating new products and processes, and improving existing ones. [9].

Technology and technical capabilities provide a complex and delicate balance in meeting the requirements of managing an NPD program. The management of technology, technological change, and innovation are essential determinants for NPD effectiveness. [10]. Successful integration of technology and new product development prevents misalignment. It is going to help in ensuring the retention of the core of the organisation. [11]. A key for an inimitable work is creativity. Creative intelligence differs from what is normally considered general intelligence. Creativity focuses on how we think and our strong desire to achieve something new or different. [12].

If original equipment manufacturer need to rely more and more on the technical capabilities of their suppliers, then it would only seem reasonable that the OEMs would try and court suppliers with the best product development and design skills for their business. Therefore, how these supply base resources are manages in an OEM/Supplier relationship can make the difference between high and low performance [13, 14, and 15].

The early involvement of suppliers in product development was instrumental in reducing lead time and avoiding production problems downstream that could prove costly [14]. Benedikt and Victor has expressed that collaborating with skilled suppliers can bring new concepts apart accessing existing technologies. [16]. Most of the companies have reduced their supply base to more effective manage relationships by exploiting supplier’s capabilities, improvements in product quality, integration of technology and reduced lead-times of product development, are some of the expected outcomes. [17].

Marc A. Annacchino says team work does not happen naturally. The manager must convert the energy of the individuals into directed energy focused on group progress, a very difficult task. It focuses on specific skill set requirements of the position and looks for those skills demonstrated in the candidate’s previous work. [18, 19]. Harold Koontz and Heinz Weihrich have defined leadership as “the art or process of influencing people so that they will strive willingly and enthusiastically toward the achievement of group goals.” [20]. Leadership and influence are certainly related and do often overlap-great leaders can wield tremendous influence and people of influence often occupy a leadership position [21]. Mentoring is essential for the new product development team. The mentoring is a relationship with an intentional agenda to convey specific content and life wisdom from one individual to another. Genuine mentoring and coaching involve an authentic personal relationship [22].

Graeme Salaman and John Storey explain the importance of innovation, increasingly identified as the critical factor in economic competitiveness. Rapid technological change,
globalization, the liberalization of trade, intense competition from low-wage economies, the reduction in communication and transport costs, shorter product life cycles and consumers switching between products and providers at an accelerated rate, require firms in advanced high wage economies to achieve competitive advantage through innovation [23]. The world’s top performing companies share a common characteristic: their superior ability to develop and introduce new products faster and cheaper than their competitors. Innovation is something we need to continuously nurture and develop. The need to build and deploy a deep capacity for innovation is as vital to the organization as any other firm wide initiative. [24].

Sense of Purpose - Edward de Bono has clearly stressed that “a strong sense of purpose is one of the most important aspects of thinking skill”. Edward de bono, who coined the term “lateral thinking” says, richness is what matters, richness in thinking, thinking laterally and turning problems around and look at them from a fresh perspective. [25]. Creating a learning team – leaders framed the challenge in such a way that team members were highly motivated to learn; and the leaders’ behavior created an environment of psychological safety that fostered communication and innovation [26]. To remain competitive organisations are moving towards team working, which works on continuous improvement, self directed and produced phenomenal results in quality, productivity and speed. It has become a key strategy for success. [27].

Tony Davila, Mare J. Epstein, Robert Shelton gives their point on learning to act and learning to learn. Learning to act is type of learning takes the current strategic objectives as given and does not question them. Learning to learn – this type of learning consists of structured processes to assess how well the organisation learns and changes. The learning to learn cycle questions the current processes as the best way to innovate. [28]. Effective selection of human resource requires skilled selectors to assess applicants, using relevant assessment criteria and relevant assessment methods, before taking decisions about the suitability of applicants for a particular vacancy. This is very much critical and suitable for new product development team professionals selection. [29].

The characteristics that affect speed differ for different types of projects and are different for team members and the team leader. [30]. Earlier studies suggest that the characteristics of individuals who work on a project play a crucial role in its successful development [31 - 35]. Mc-Donough and Spital for example, found that the successful development of projects was associated with characteristics that included what they termed a general business orientation [36]. Knowledge capture and utilization in new product development can improve firms existing performance. Although research in new product development (NPD) has been ongoing now for over forty years, the failure-rate for new products has remained stubbornly constant and normally one third of the new product developed has been recorded to have a commercial success. [37].

The theory base and literature survey has provided the opportunity to understand the wide and deep study and outcome of various factors related to new product development. There has been wide solitary coverage of each factors but no theory or paper published with model framework. With the above the background and also from the observations the factors has been separately identified in various forms but not grouped. Also there is no framework from the factors that leads to improving the excellence in the engineers.
ARTICULATION OF PRACTICES AND CONCEPTUAL MODEL

The understanding of the existing systems and practices in the requirements of the critical factors for new product development has been taken as the basis. This is being supported with 22 years of experience of the researcher in automobile industry with fundamentals in process engineering and established in new product development, techno-commercial activities. Around ten factors have been evolved from grouping of various positive variables from practice and literature survey. A gist of the factors has been provided below.

- **Interpersonal** is a process of successfully influencing the activities of a group towards the achievement of a common goal.
- **Techno commercial** basically represents the exposure of professionals in technical as well in commercial aspects in new product development. It improves the effectiveness and efficiency during development of new products.
- **Creativity** refers to the phenomenon whereby a person creates something new that has some kind of value.
- **Lateral thinking** is a creative skill from which all professionals can benefit enormously. **Proactive thinking** on the other hand, engrosses foresight. To be proactive means to think ahead, in anticipation of future.
- In any organization, **continuous learning** means growth through learning events and experiences. It can be applied to individuals, team, and organizations- a process that will help them to achieve their overall objectives.
- **Supplier integration** into new product development suggests that suppliers are key in providing information and directly participating in decision making for new product.
- **Cross-functional working** team is a group of people who collectively represent the entire organization’s interests in a specific product or product family.
- **Innovation** typically involves creativity, but is not identical to it: innovation involves acting on the creative ideas.
- **Leadership** is taking responsibility for determining when to ask someone else to make a decision or carry out a task.
- **Managing Excellence in engineers (ME2)** defines the way to take up the new product development professionals to a platform where there is existence of growth for the individuals and thereby to the automobile industry. It enables the encouragement of the identified factors in an individual and paves way to the future by nurturing the basic human traits. It provides a self introduction.
A conceptual framework had been developed with continuous learning, interpersonal skill, techno-commercial skill, lateral proactive thinking, and creativity as the base and linked to cross-functional working, supplier integrating skill, leadership, and innovation. The logic here is that, with the five factors as base, a new product development professional is able to do their best in cross-functional working, supplier integration, leadership, and innovation. Also, there is cross-link between cross-functional working, supplier integrating skill, leadership, and innovation. This subsequently leads to endow managing excellence in engineers (ME2) for new product development, the foundation that enables a positive growth to individual and to also to the automobile industry.

**The Variables**

**Independent variable**
- Techno commercial
- Interpersonal
- Lateral proactive thinking
- Innovative quotient
- Cross functional working
- Supplier integrating skill
- Leadership
- Creativity
- Continuous learning

**Dependent variable**
- Managing excellence in engineers
OBJECTIVES OF THE STUDY
To identify the factors and create a framework which are important in selecting and managing excellence in engineers for developing new products in automobile original equipment manufacturing industry in India.

RESEARCH DESIGN AND SAMPLING DESIGN
Descriptive research has been planned for this study to start. The study is a fact finding investigation which is aimed at describing the characteristics of individual, situation or a group (or) describing the state of affairs as it exists at present. The plan of this descriptive research is to evolve with a framework which will be used to predict the intake of human resources for new product development.

Type of Population – finite universe: In our study we are planning to cover automobile industry in India.
Sampling Unit – social unit: Organisation which is producing new product automobile in India with a minimum turnover of above 1000 crores.
Sampling Frame or Source List – The source list will be middle and top management of the organisation in India which is producing new product automobile.
Population Parameters – Middle and top management executives working in India for new product development (techno commercials) handling drawings from designers (internal customers) and responsible for the development at cost, delivery and quality of the finished product through suppliers.
Size of Sample – Organisations which are in the business of producing automobile. Middle management executives and top management executives. Cochran’s sample size formula was used to finalize the sample size, which was 110. The same has been increased to 500 for reliability.
Sampling Plan - Probability, purposive / judgmental sampling plans selected in such a way that only the important item representing the true characteristics of the population are included in the sample.

CONTENT VALIDITY RATIO (CVR) CONFIRMATION FOR SUBJECT MATTER EXPERT AND PROBABLE RESPONDENT
The Content validity ratio (CV ratio) was checked for its statistical acceptance level using the formula - CVR = [(E - (N / 2)) / (N / 2)] , where E – Number of subject matter expert or probable respondent who rated the object as essential and N – Total number of experts.

OBSERVATIONS AND RESULTS
The observations captured from the content validity check was that the CVR for the clarity and relevance of subject matter expert and probable respondents were found satisfactory and are given in the table below.
Table 1 for Content Validity Ratio report of subject matter expert and probable respondent

<table>
<thead>
<tr>
<th>Type of respondents</th>
<th>Number of respondents</th>
<th>Expected CV ratio (for 5 respondent it should be 0.99)</th>
<th>CV ratio for Clarity – minimum and maximum obtained</th>
<th>CV ratio for Relevance – minimum and maximum obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject matter expert</td>
<td>17</td>
<td>For 15 min 0.49</td>
<td>0.53 – 1.00</td>
<td>0.53 - 100</td>
</tr>
<tr>
<td>Probable respondents</td>
<td>16</td>
<td>For 15 min 0.49</td>
<td>0.63 – 1.00</td>
<td>0.75 - 100</td>
</tr>
</tbody>
</table>

From the content validity values the requirement for our study are aligned to the practices in the industry.

CONCLUSION

The content validity ratio (CVR) computed is achieving the target value. This gives the understanding that there exists alignment with the real time new product factors. The logical relations among the factors are provided in the frame work. This study is expected to ascertain the critical factors for new product development. Further progress of this may reveal a quantitative relationship among the factors for induction of new product development professionals and that leading to managing excellence in engineers for new product development. It may enable in profiling human resource with a system framed in recruiting and positioning resources. This provides the organisation a chance to serve the customer as they wish and beyond.

The goal is to rise to the standard and raise the standard. A proper implementation of Human resource induction management provides sustainable competitive advantage to an organisation, even when competitors adopt similar new product development management “best practices”.

LITERATURE REVIEW


[5] - ‘Talent on Demand’ Applying Supply Chain Management to People - Published: February 20, 2008 in Knowledge@Wharton.


