Theoretical Structure for Launching New Product Development (NPD) in Automotive Industry

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Abstract:

New Product Development (NPD) is critical strategy in automotive industry. (NPD) is a necessary activity for automakers survive in today’s turbulent markets. Many automakers have built competitiveness and obtained tremendous profit through (NPD). Automakers to provide variety of customer’s demands also revenue growth, and competition need to be innovative, (NPD) framework will provides practical way to approach to its goal. The purpose of this paper is to review the nature of (NPD) .it consider classification of (NPD )in automotive industry , necessity of launching (NPD )in automotive industry , benefits of being the first in automotive industry and, factors that affect (NPD) by introducing a framework for launching( NPD) in automotive industry.

Key words: New Product Development (NPD), Automotive Industry, Automaker, Automotive Market

1. Definitions of New Product Development (NPD):

According to the literature review there are lots of definitions for New Product Development (NPD) such as:

1.1. New Product Development (NPD) is a process which starts from a motivating goal, moves through an idea conception phase, is reduced to practice in its implementation phase, and is completed in a transitional phase, during which time the product becomes established.

2.1. The overall process of strategy, organization, concept generation, product and marketing plan creation and evaluation, and commercialization of a new product and also frequently referred to just as product development.

3.1. The process a product goes through before introduction, involving seven phases: idea generation, screening ideas, concept testing, business analysis, product development, test marketing and commercialization.

4.1. The overall process of strategy, organization, concept generation, product and marketing plan creation and evaluation, and launch of a new product. Sometimes restricted in meaning to that part of the process done by technical (R&D and manufacturing) departments, Sometimes used to denote the person or persons engaged in the new product creation task. New Product
Development (NPD) concerns activity within an organization, in contrast to the acquisition of finished new products from outside.

5.1. The creation of new products needed for growth or to replace those in the decline stage of their life-cycle; the stages in the New Product development (NPD) process are commonly listed as idea generation; screening; concept use of marketing research during New Product Development (NPD) process development and testing; the formulation of marketing strategies; business analysis; production; market testing; and commercialization.

6.1. Besides to these definitions it is interesting to note that New Product Development (NPD) is not the only term used to describe the process by which new products are developed. The particular term employed depends on the discipline of the researcher. Hence, “NPD” tends to be the label used by those in marketing; those working in technological fields refer to “innovation”, while those in the sphere of engineering often refer to “design”. In this paper, the term NPD is used to describe a multidisciplinary process that involves many separate tasks which begins with an idea and ends with the launch of a new product in automotive industry.

2. **Classification of New Products in Automotive Industry:**

If we approach innovation from the automaker’s point of view, products can be classified into several categories:

1.2. **Me-Too Products:** A ‘me-too product’ is a product that is basically the same as an existing one, but produced by another automaker. This category of new products represents the largest group of new automotive products. For instance: A green vehicle or environmentally friendly vehicle produced by both Fiat and Toyota.

2. **Line Extensions:** These are new variants of an established product. Typical examples are new color for existing products or new option in a family of products. The design process of these products can be characterized by relatively little effort and development time, small changes in the manufacturing process, little change in marketing strategy and a minor impact on storage and/or handling techniques. Good example is Maruti Suzuki Zen LX, Zen VX.

3. **Repositioned Existing Products:** These are current products that are again promoted in order to reposition the product. For example, by the increased attention for better and safety stop or controlling cars in difficult situations, new version of Anti lock braking system (ABS) introduced to automotive industry. The development time for repositioned products can be minimal and only the marketing department should put efforts in capitalizing the position market.

4. **New Form of Existing Products:** These are existing products that have altered to another form. These products may require an extensive development time because the physical properties of the product change drastically. For example: Peugeot 206 which is sedan car originally, has altered to Peugeot 206 SD which is a hatchback model by Iran Khodro Company (IKCO). And SAIPA (Automobile Manufacturing Group in Iran) launched the Iran-made "Saipa National Engine 231" and unveiled its new model: "Miniator” which is new developed version of its established product.

5.2. **Innovative Products:** These are defined as products resulting from changes in an existing product otherwise than described above. The changes must have an added value. The design process is generally longer and more expensive when more product changes are required.
Marketing can also be costly because consumers may have to be educated to the innovation. However, in some cases time and costs of innovation are relatively little. For instance: in the case of a successful innovative ,good example is “Tata Nano” which is a city car manufactured by Tata Motors ,one of the smallest as well as lowest powered (35ps) cars in the world.

6.2. Creative Products: also called true new products. This type of products is described as one newly brought into existence, i.e. a never-before seen product. Creative products commonly require extensive NPD, tend to be costly (much marketing effort, new equipment) and have a high failure chance. For example: personal vertical takeoff and landing (VTOL) including (100LS, 200LS, M400 and Autovolantor) which has introduced by “Moller International”.

3. Purposes of New Product Development (NPD) in Automotive Industry:
Automakers spend large sums of money for new product development (NPD) due to many important reasons. The reasons for new product development (NPD) in automotive industry are: corporate growth, diversification, and the quest for a competitive edge over rival automaker. There is another specific reason for an automaker to develop new products: exploiting new opportunities. The demand for certain product attributes can suddenly become so intense that automaker is well-advised to create and introduce new marketplace for the new products in order to exploit this new opportunity and meet the strong customer demand. Product development is potentially very important for the purpose of the business development in automotive industry. Along with other forms of development such as market development, product positioning development and supply development, product development can contribute to the attainment of key business objectives. One of the most important objectives can be contributed to by new product development, it is rarely explained how this can be made to occur.

4. Necessity of Launching New Product Development (NPD) in Automotive Industry:
Launching New Product Development (NPD) in automotive industry has become a key driver for revenue growth, competition and, for some automakers, even for survival. The ability to launching New Product Development (NPD) to the automotive market quickly, efficiently and ahead of competition is becoming increasingly important. An efficient new product launch requires integration and coordination among multiple functional areas, including product design, procurement, planning, manufacturing, sales and marketing. In addition, as organizations increasingly leverage core capabilities of other automakers, New Product Development (NPD) has to be delivered through virtual networks, working with partners in a collaborative environment in order to bring new products to the automotive market faster, smarter and cheaper. Consequently, automakers need to integrate itself internally and also externally with suppliers and customers, creating end- to- end supply chain processes and capabilities which impose differences on new product and customer requirements. The New Product Development (NPD) as a fundamental component of automotive industry is made up of all decisions that an automaker makes including six main elements, namely: “who, what, when, where, why and how much” an automaker needs to provide its new product and receive value for its effort.”

5. Obligation of Changes in Automotive Industry:
Some of the changes in automotive industry, that have the potential to impact a new product development (NPD) include:
1. Increased levels of competition
2. Rapidly changing market environments
3. Higher rates of technical obsolescence
4. Shorter product life cycles

6. Benefits of Being the First in Automotive Industry:

The importance of being the first on the automotive industry is discussed extensively in various sources. Besides the instinctive idea of being the first, other measurable benefits are possible for those that get on the automotive industry sooner with innovative new products:

1. Increased sales through longer sales cycles
2. Increased margins
3. Increased product loyalty
4. More resale opportunities
5. Greater automotive market responsiveness
6. A sustained leadership position

7. New Product Development (NPD) Launching Structure:

New Product Development (NPD) launching structure in automotive industry can be consisted of the following elements:

1. New Product development (NPD) strategy
2. New Product development (NPD) process
3. New Product development (NPD) methods
4. New Product development (NPD) tools
5. Organization structure to support new product development (NPD)
6. Management of the development structure

1.7. Strategy of New Product Development (NPD):

The strategy of new product development (NPD) includes several components. The first component is “Customer In,” including the recognition of the customer as the reason for being and the use of approaches to gather customer requirements and ensure customer satisfaction. Establishing the strategy itself includes the development of "Customer In" data and information about the competition, technological change, and sales potential. Next, the product development portfolio establishes the desired mix of development efforts from incremental to research. The final component is the process of screening and selecting new product development (NPD) projects.
1.1.7. "Customer In" Understanding the Customer and the Automotive Market:

Customers want higher quality goods, at low prices, targeted just for their needs. “Customer In” enables automakers to direct all efforts, including product development efforts to achieve high levels of customer satisfaction. “Customer In” is a philosophical underpinning a strategic choice to be customer oriented. It starts with the automaker’s leaders and permeates the entire company’s culture. It includes guiding principles such as: Treating the customer as king or queen, Thoroughly understanding the customers’ use of the products, Meeting customer desires and needs, not just demands and specifications, Anticipating the customers’ desires and proactively contributing to customers’ success. “Customer In” is also a comprehensive set of elements, systems, and processes designed to achieve customer focused goals. It uses a multitude of “listening posts” to understand and anticipate customers’ desires and needs, the potential market, and competitors’ current and future capabilities. These listening posts can include structured visits to customers, seminars, trade publications, and complaint reports, comparisons with competitive products, joint calls on end users, market trend analysis, demographics, and many other sources of input. This type of detailed automotive market analysis and competitive evaluation provides the direction essential for continued new product development (NPD) success.

2.1.7. Establishing the Strategy of New Product Development (NPD):

In order to combat potential pitfalls encountered in new product development (NPD) projects, an automaker must establish and utilize a comprehensive development strategy. Establishing strategy requires a proactive approach, which combines the study and understanding of two critical elements of the strategy: Customer In and the marketplace, and automaker’s core technologies and research into future technologies (both design and manufacturing). A thorough understanding of these elements requires gathering data about customers, markets, technologies, and competitors. To make sense of this information, functional maps are useful. Some typical maps include: 1. Product Profile: comparing product features and attributes relative to competitors 2. Product Generation: timing and life cycle of products and the relationship of one product to another 3. Engineering Skills: skills composition of the engineering workforce 4. Performance Tradeoffs: range of performance combinations possible among dimensions that may conflict (e.g., weight and efficiency) Integrating the two elements of the strategy (technology and market) enable leaders to formulate good decisions about a desirable future product portfolio with clear goals and objectives. These frontend activities provide the opportunity to address policy issues, market timing and frequency of introduction, technology availability and development, product differentiators, cross functional and multiple project related concerns, skills development, training, hiring and resource balancing. Technology does not have to be developed only from within the company, but can be the result of acquisitions, joint ventures, and automotive industry association efforts. Competitive evaluations provide the ability to make the above decisions armed with the knowledge of what the main competitors’ plans are, allowing the automaker to stop these plans with strategies for automotive market timing, pricing, competitive features, and technology investment and introduction. Automotive market intelligence provides the instruments to assess what the automotive market is demanding by regional areas or target customers, anticipate developing customer trends, identify product differentiators, and determine what pricing the automotive market can bear, predict new product life cycles, and assess sales volume potential. Once the information is gathered and evaluated, leaders can establish the strategy. The strategy includes priorities for which products must be
developed and in what sequence, over a three to five year time frame. The new product development (NPD) strategy must result in automakers plan for development and implementation of the knowledge and capabilities available. It should be structured so as to have the technology or process available and proven out prior to project implementation. Leading edge automakers develop and integrate product technology, marketing, process development, supplier, quality and other roadmaps, throughout the business, that support the strategy and evolve into a multifunctional product development roadmap. Once the strategy is crafted, portfolio and project selection can occur.

3.1.7. Developing a New Product Portfolio:

One of the greatest challenges faced by any automaker, which must survive competitive pressures, is the determination of what new products to develop to meet automotive market needs, at what price and at what entry point in time. A subset of this decision process involves deciding how to best use available resources to develop new products that fall into the following three categories:

1.3.1.7. Platform or Next Generation Products: Platform products constitute the core of the automaker’s business. They typically have a longer design life because they comprise the basic architecture which incremental new products can be based on. Platform products provide core customers with a complete systems solution; break new ground and involve a significant shift from existing platforms in new product design and process design. The core offerings must provide the desired modularity and standardization, which can be built upon without adding undue complexity.

2.3.1.7. Incremental Products: This category includes the improvement or expansion of current product platform offerings with the addition of new performance or aesthetic features; Improvements in design to use more standard parts or modules; And improvements required for manufacturability, reliability, or cost considerations. Incremental products could be needed to address niche markets or to enhance the product portfolio before the next platform products are released.

3.3.1.7. Breakthrough Products: This category of development is even more radical than the platform products, usually requiring the use or development of new product and material technologies and related new processes to manufacture the product. Such a product could be the beginning of a new product category and could serve to elevate the automaker’s position relative to its competitors by being first to market with a product in a new business area. In the product development strategy, all three of the above development products are supported by the desirable research and development projects that invest in the new product, material, or process technology knowhow necessary to address technology trends. The leadership must determine what percent of resources to allocate for platform, incremental and breakthrough development projects.

4.1.7. Selection of New Product:

The final component of the Strategy of New Product Development (NPD) is a reliable process for selecting development projects. The selection process is founded on a clear understanding of the markets and competition, a well articulated strategy, and targets for the development portfolio. Many automakers are slow to surface and act on new ideas. Therefore, the front end of
the development process often presents the greatest opportunity for cycle time reduction. Automakers should be open to new product ideas from both internal and external sources. For expediency, new product ideas must be encouraged, discussed in a responsive forum, and acted upon in a timely fashion. Clark and Wheelwright describe a funnel, which screens a variety of project opportunities and eventually selects a few projects for development. The selection process begins with idea generation. Automaker should institute procedures and incentives that encourage ideas from throughout their company and its customers and suppliers. Monthly or quarterly, or when a special need arises, new ideas go through an initial screen to determine completeness or readiness for review. The review team checks the idea’s fit with the development strategy, required areas of knowledge, and potential impact. While some ideas are rejected, most move ahead with a least some further investigation to detail the proposed project and its benefits. A second screen is used as a go/not-go decision point. Projects that pass this screen are chartered and launched into the new product development (NPD) process.

2.7. Steps for Launching New Product Development (NPD) in Automotive Industry:

The following steps briefly summarize the major dimensions of new product development (NPD):

1.2.7. Clarify the Automaker’s Goals and the Strategic Role of New Product Development for Competitive Advantage: New product development (NPD) can play a variety of roles in defining corporate strategy to gain competitive advantage. This variability makes the process of new product development (NPD) subject to the emerging automaker’s issues of the day. In general, a long run, focused, and ongoing strategic commitment to attractive automotive market opportunities should define the role of new product development (NPD). New product development (NPD) should be integrated into an automaker’s strategy and significantly contribute to its continuous renewal. Achieving this integration requires the dedication of intellectual resources at all organizational levels. This intellectual process begins with responsiveness to the business environment.

2.2.7. Build Flexibility to Cope with and Mediate Environmental Turbulence: unstable global business environments are the source of new product opportunities and problems for automakers. Consequently, the critical factors defining the automotive market environment for new products must be scanned on a regular basis. In particular, the effects of technology that reduce the life cycles of products must be carefully monitored. For example, the effects of changing information technology will continue to alter the way that automaker innovate, design, manufacture, and market new products, as well as the way that consumer and other stakeholders respond to those products. They may even redefine markets from traditional channel dependent institutions to direct, interactive exchanges between buyers and sellers. Consumers may dial up an electronic catalog, send in specifications, and receive a customized product (from flexible manufacturing processes) through an express delivery service in days.

3.2.7. Anticipate Market Acceptance of New Products: The crux of new product development (NPD) is identifying the unmet needs of potential buyers and other key market
stakeholders as the basis for defining automotive market opportunities and translating them into core new product concepts. Potential buyers who are affected by unstable global environments respond largely to their own needs and problems. Identifying the needs of potential buyers and segmenting markets according to those needs is a challenging prospect, but one that enhances new product acceptance. It requires a variety of research approaches that should bring the innovating organization as close to potential buyers as possible. In fact, for many situations, new product development (NPD) should be viewed as an interactive relationship between the innovating automaker and potential buyers (and other key stakeholders) to jointly define and develop the new product. The best way to anticipate automotive market response for a new product is to jointly create it with potential buyers, then estimate when and how many consumers might enter the market to buy.

4.2.7. Prepare the Organization for the Change Needed to Develop New Products on a Regular Basis: The new product development (NPD) paradox suggests that automakers respond to the demands of a new product in ways that often create organizational resistance and slow development time. To overcome this resistance, strong leadership, good management, cross-functional teams, and new product champions are crucial. Although the prescription for success may be clear, implementation can be difficult. How does the interruption of organizational processes by new products affect individual career patterns? What are the incentive systems that will motivate highly qualified individuals to join high-risk new product development (NPD) teams? Where in the organization should the new product development (NPD) team be located internally or externally? Resolving automaker’s issues related to new product development (NPD) requires an understanding of critical organizational processes such as strategic choice, influence, communication, decision making, resource allocation, and implementation. Studying and profiling these processes in terms of an automaker’s tendency to innovate will help (1) identify areas needing change, and (2) if processes cannot be changed in a reasonable time, estimate response time to innovate. The outcome of this process will be realistic estimates of development cycle time. The process will also help focus educational efforts among employees to bring about an enlightened view of new product development (NPD) and its role in the future of the automaker and their own careers.

5.2.7. Operationalize an Ongoing Process of New Product Development (NPD):

How an automaker decides to respond to environmental forces, organizational resistance, and market stakeholder needs defines its new product development (NPD) process. This process has been observed to be sequential, overlapping, holistic, or chaotic. However, because business situations vary, each automaker should craft a process that enables it to (1) maintain a strategic focus, (2) remain flexible to cope with varying degrees of environmental instability, (3) interact with the market to anticipate and/or overcome friction in formulating the new product, (4) integrate organizational efforts and resource commitments to motivate the process through cross functional new product development (NPD) teams, and (5) commit to new product development (NPD) as an ongoing process of organizational renewal. The process should encompass different levels of product concept refinement (ideas, concepts, prototypes, products, and launch programs) and critical management activities (diagnosis, search, design, evaluation, decision making, implementation, and monitoring).
6.2.7. **Build a New Product Decision Support System:** Observation of new product development (NPD) as an ongoing organizational process requires a decision support system to provide timely information. Key elements are identifying new product decision problems, modeling those problems, establishing a database of the important variables and relations in the model, collecting and analyzing the data through marketing research methods, and using optimization procedures to find the best decision. The design and implementation of new product decision support systems should be linked to an organization wide system to build a useful historical database yet provide a capability for offline analysis to support rapid retrieval and manipulation of data. Further, the role of decision maker judgment in data collection and modeling activities should be integrated into the new product decision support system, although with care and scrutiny in order to continually learn from its use.

7.2.7. **Estimate the New Product Market Opportunity:** The objective of automotive market opportunity forecasting is to clarify the nature of a market opportunity and to estimate its market potential and market penetration. To accomplish this objective, a model of critical factors that drive the new product opportunity should be formulated, data should be collected to operationalize the model, and the resulting forecasts should be updated throughout development. Estimates of year to year growth, possibly obtained from a database of analogical diffusion models, are critical for rapidly deciding the value of a new product idea. Unfortunately, the procedures for quickly screening new product ideas with such information rely heavily on judgment. Future research on expert systems and industry based product analogy data bases may help to improve the speed and reliability of automotive market opportunity forecasting. In addition, the use of enhanced scenarios employing advanced multimedia technology to further define a core concept in the context of rapidly shifting environments is a promising way to better understand the possible evolution of and response to new products.

8.2.7. **Formulate a Sales Forecasting Process that Captures Automotive Market Response to New Product Alternatives:** In developing models for any of the forecasting processes, but especially sales forecasting, several guidelines should be considered:

1. Develop a system of conceptual models that includes relevant variable

2. Develop a managerial decision model that is simple, intuitive, and logical; if after very careful study it is not understood, revise it or don't use it.

3. To the extent possible, develop rigorous sub models of selected variables in the spreadsheet model to improve estimation and link decisions to market response.

4. Use a variety of data sources (market studies, expert judgment, secondary data) and methods (such as perceptual mapping, positioning, conjoint analysis of preferences and simulations) to operationalize the models and sub models.
5. Submit the model to sensitivity tests with different values and check for robustness.

6. Check assumptions carefully.

7. Use multiple, different, and independent approaches and reconcile estimates when they are divergent.

8. Formulate alternative scenarios using variation in the values and assumptions of the model and consider contingencies

9.2.7. Establish a Financial Forecasting Capability that Provides a New Product Control Chart: Combining market opportunity and sales forecasts with estimates of new product costs, investments, risks, and development cycle time provides a financial control capability that can be summarized in a control chart. The format of this control chart should be agreed upon by the new product team at the outset of the project and followed thereafter. It should include the key measures of performance that guide the pre-launch development and post-launch tracking of the new product. Continual updating of all major forecasting processes to reflect changes in the shape of the new product and in the organization and market environment is the basis for realizing a capacity for control throughout new product development (NPD).

10.2.7. Consider Test Marketing as a First Step to Implementation: Prior to launching a new product, it is strongly recommended that market’s entry strategy and launch marketing program be orchestrated and tested. This process should involve the use of simulated, controlled, and/or conventional test marketing to evaluate, decide, and refine the product and its launch program. Designing and implementing test marketing approaches should consider the nature of the implementation problems, the new product, its importance to the organization, and the amount of uncertainty in the market environment. In some cases, test marketing can be bypassed in favor of immediate market entry. This approach can succeed with careful attention to tracking the new product launch and modifying accordingly.

11.2.7. Develop Market Entry Approach that Capitalizes on the Current Market Situation and Complements the Strategic Role of the New Product: Market entry for new products is highly situational; being first does not always pay. The market entry approach should reflect environmental, organizational, and market factors (potential buyers, competitors, trade, stakeholders) that define the situation. A market entry approach should be based on the timing, scale, and resonance of the launch marketing program. Using market opportunity, sales, and financial forecasts can provide input to an approach for modeling market entry decisions. In particular, launch timing is critical when cycle time and/or competitive factors can make a difference in performance. Recognizing time as a key variable, and making it the focus of a special decision model, may be the best way to handle this market entry decision.

12.2.7. Launch and Track New Product Programs to Implement Needed Modifications for Success: Once a new product is launched, the use of various data
collection procedures and forecasting models to track performance, modify, and otherwise
control the new product can lead to product and program improvements or to a comfortable
decision to terminate the product. One issue related to how much effort an automaker is willing
to invest in post-launch tracking is problem diagnosis. Quick fixes and program changes that are
based on impressions of market problems rather than diagnosis can lead to a products early
demise or the extension of mediocre performance. Finding early launch marketing problems may
lead not only to quick modifications, but also to the next generation new product. Experience has
shown that although it will not be used often, diagnosis can be helpful in all pre and post launch
circumstances, even in a postmortem sense. The ultimate value of new product development
(NPD) may be the learning it makes possible learning how to adjust the marketing program to
consumer needs; learning how to educate the potential buyer on the benefits of the new product;
learning why the product won't succeed in the market and why it should be abandoned now;
learning that complete withdrawal is not necessary, but that a next generation product can
overcome the diagnosed difficulties; and, perhaps most importantly, learning to have the patience
to learn.

3.7. **New Product Development (NPD) Methods:**

There are several different methods which automakers can utilize them in launching process of
new product development (NPD). Some important methods are as follow:

1. 3.7. Managing the Front-End
2. 3.7. Evaluating Trade-Off
3. 3.7. Set Based Concurrent Engineering
4. 3.7. Lean Production Preparation
5. 3.7. Variety Effectiveness
6. 3.7. Risk Management

4.7. **New Product Development (NPD) Tools:**

Here has introduced 12 mostly used tools during new product development (NPD) by
automakers:

1. 4.7. Quality Function Deployment (QFD)
2. 4.7. Kano Methods
3. 4.7. Design Quality Estimation (DQE)
4. 4.7. Design To Unit Production Cost (DTUPC)
5. 4.7. Design for manufacture and assembly (DFMA)
6. 4.7. Design Failure Modes and Effects Analysis (DFMEA), Process Failure Modes and Effects
   Analysis (PFMEA)
7.4.7. Value Engineering

8.4.7. Variety Effectiveness Process (VEP)

9.4.7. Mistake Proofing or Poka-Yoke

10.4.7. Reliability Engineering

11.4.7. Gage Reliability and Reproducibility

12.4.7. Product Date Management (PDM), Computer Aided Design (CAD), Computer Aided Manufacturing (CAM)

5.7. Organization Construction to Support New Product Development (NPD):
Organization to support new product development (NPD) includes establishing the organizational hierarchy, development teams and roles, responsibilities and rewards that support rapid and effective new product development (NPD). Concurrent engineering promotes better inter functional dialogue and more frequent communication during the design process. A cross functional team established during the front end of the development process is highly recommended. Getting team members involved early in the game in participating in the decisions presents the following benefits:

1) Individual member skills are blended with others to bring together a wide array of talents, experiences and knowledge. Together, the quality and creativity of the solutions is greatly improved.
2) All members feel like they have a stake in meeting the program objectives.
3) Concurrency is made possible, dramatically cutting cycle time.
4) Team discussions result in improving the quality of input to the design.
5) Manufacturability issues are more readily addressed.
6) Communication between team members is improved and consensus decision making more easily achieved.
7) Team decisions are proactive and avoid having to be repeatedly adjusted for late input.
8) Conflict between functional areas is greatly reduced.
9) Increased learning and an accelerated learning curve are an outcome.
10) Collocation of team members further improves camaraderie, open and frequent communication, and accelerated problem solving.

Figure No.1 shows four forms of team organization based on the strengths of the team leader and team members, and constraints imposed by organization structure. Additionally, depending on the type of development program, the team organization could be different. For example, a team set up to develop a new platform would have greater success if either the “Strong Team Leader” organization form or the “autonomous team” structure was supported. To develop a breakthrough type product that creates a whole new market for the business, the preference is to create an autonomous team organization for maximum leverage if such a strongly self motivated team can be assembled, although a strong team leader can help compensate for functional organization pull on the rest of the team. The challenge of selecting and staffing the development team is not a trivial one. Often not enough thought is given to this issue. A high performance team tasked with new product development (NPD) has to be cohesive. Considerable effort needs to go into selection, team training, agreement on goals, blend of skills (both unique talents and multi skilled individuals), and percentage of time dedicated to team efforts. Experience suggests that the more the following criteria can be satisfied, the better the team’s performance will be:

1) Select an experienced and respected team leader, preferably from the senior ranks. Team leadership can be shared between a strong program manager and a technical person from the
engineering organization. The former serves as the organizer and primary interface to the senior management team, as well as the team’s advocate for decisions required of senior management. The latter provides the engineering leadership to achieve and exceed the program’s goals and objectives within the framework provided by the program plan and schedule. 2) Fulltime team membership should not exceed eight members, but must be able to represent marketing, sales, product design and engineering, manufacturing engineering, manufacturing, material, and quality representatives. 3) Roles and responsibilities must be clearly defined. 4) Team members are trained in high performance teaming skills. 5) Team members serve from new product concept too shortly after the first few shipments of product. 6) Core team members are assigned to the team fulltime if their skills are required to work critical path activities. The remaining members are assigned between 70% and 80% of the time to the project. 7) Team members are preferably volunteers. 8) Team members are given a clear mandate and objectives. 9) Risk taking is encouraged and not punished if things go wrong. 10) Team members are allowed to make most decisions effecting rapid progress, e.g. resources to be used, tradeoffs, supplier selection, etc. 11) Team members are responsible to the team leader and are not held to functional based goals and objectives. 12) Team members are collocated. 13) Team members are given the tools, equipment, and priorities they need to accelerate development. 14) All personality types are included on the team to provide diversity and balance (as indicated by a Myers Briggs type indicator). The real world does not usually permit some of these criteria to be fully or sometimes even partially met. Organization priorities generally prevent fulltime dedication to the team, resulting in a less than ideal commitment to the product development team. Depending on the project scope (incremental vs. platform), team members may not be dedicated or may have to pull in some part time resources to supplement the core team members. Internal politics may prevent team members from being fully committed to the team leader and the development program.

6.7. Management of the New Product Development (NPD) in Automotive Industry:

Management of the new product development (NPD) framework includes clear sponsorship and ownership of the development process, project management, and performance measurement. It also includes the support and behaviors of managers and executives.

1.6.7. Sponsorship, Ownership, and Project Management:

Management participation and intervention in new product development (NPD) is required for the following: sponsorship of a project, management reviews, decision making which the development team members are not authorized to make, decision making which could result in a change in direction or a reevaluation of goals or targets, and expert guidance. The level of management involvement with the team will be influenced to some degree by the team organization structure and a level of autonomy determined by team leader and member skills. Either adopting a hands-off approach once the team has been selected or imposing too much management oversight, can be detrimental to the project’s success. The Development Framework should have assigned process sponsor, usually the Vice-president of Engineering and Development. The sponsor’s roles include assigning priorities, allocating resources, managing interdependencies, and reviewing progress for all projects in development and projects in the screening process. The Development Framework should also have an assigned process owner. The process owner’s roles include ensuring that the appropriate methodology is followed, understanding best in class development processes, measuring and evaluating the performance of
the Development Framework, and improving the Development Framework. Project management requires a blend of technical and program management skills. Each project should have an assigned project leader, often a chief engineer. The project leader may play a dual role. However, often the project leader and a program manager are assigned to the same development project to complement each other's skills. Their roles parallel the sponsor's roles except that they are focused on a specific development project.

2.6.7. **Performance Measurement:**

The process of setting goals, monitoring progress, and rewarding good performance provides the motive force that ensures fast development cycle times. Setting goals that are supportive of a business strategy which encourages product innovation and rapid product development can be a great cohesive force, particularly when team members have some say in establishing the goals. It serves to get the key players pulling in the same direction and gives them and the senior management team measures of the degree of accomplishment. Goals should be set so that they are measurable; Achievable but challenging; An accurate representation of the tasks that must be performed, and support the ultimate objective of rapid and cost-effective development. Goals extend beyond the need to identify the real requirements the product has to meet and to verify the ability of the product to meet those requirements. They should be set so as to achieve a competitive edge and yet minimize any negative impact to the organization. Goals can be set to achieve a wide variety of objectives. Some typical goals designed for this purpose are:

1.2.6.7. **Automotive Market Goals:** These take the form of automotive market share, revenue and profitability (by automotive market segment), revenue distribution following new product introduction through product life cycle, automotive market share growth and distribution by product portfolio components, etc.

2.2.6.7. **New Product Portfolio:** The percentage distribution of the new product development (NPD) effort between products that fall into breakthrough, platform or incremental development objectives, and the change in distribution as the business strategy evolves with time.

3.2.6.7. **Design to Unit Production Cost (DTUPC):** The purpose is to challenge the design team to make cost-effective decisions. The process of setting these goals is to take the new product cost target and allocate costs to the various subsystems and modules so as to continually estimate the impact of design decisions on cost by managing to a cost budget. In this case, one must be careful not to permit other costs within the organization to increase because of the decisions made to reduce product specific costs.

4.2.6.7. **Development Cycle Time (Time To Market):** This has to be set with the goal of being first to automotive market. The measurement of cycle time should also involve measurement of the various phases of activity starting with birth of a concept through shipment of the first product. The goal established would be progressively more difficult for succeeding products, within the context of a continuing attempt to reduce development cycle time through improvements in the design and development process.

5.2.6.7. **Design Quality:** The objective in this case is to use information on existing process capabilities to predict or estimate the quality level at which the as designed product can be built, through preliminary and detail design phases, and through pilot production to full production. This tool helps the team make design decisions which minimize problems in manufacturing and assembling the product, and can lead to desired improvements in product design, materials and processes needed to achieve the target. It also helps minimize the “Cost of Quality,” which
ultimately affects the bottom line. It reinforces the need for Design of Manufacturability (DFM) and Design for Assembly (DFA) disciplines

6.2.6.7. **Variety Effectiveness**: These goals would be set with the intent of using parts, materials, functional modules, software functionality, etc. that already exist in other related products within the product line or across product lines. Such goals direct the automaker towards greater variety effectiveness and reduced total costs as mentioned in ‘Automotive Market Goals’

7.2.6.7. **Percentage Reuse**: Several metrics could result from the desire to achieve variety effectiveness. Metrics examples include tracking standard parts, common product modules, subassemblies and software modules reused in new products as a percentage of the total count of those criteria. Goals established early in the development process establish a target to be achieved by the product development team.

8.2.6.7. **Expense Budget**: In spite of its being a nonrecurring cost, the expense budget is an important element in containing development costs through the management of internal and external resources applied to the development task.

9.2.6.7. **Engineering Productivity**: This can take the form of engineering hours per project tracked by project type (breakthrough, platform or incremental). Actual hours versus planned hours is another useful measure

8. **New Product Development (NPD) and its Effective Factors:**

New product development (NPD) is an interdisciplinary activity (DAVILA, 2000) including marketing management, organizations, engineering design, operations management and requires contributions from nearly all the functions of an enterprise, whether it is an upgrade (an improvement of an existing product) or a new concept either to the company or to the market. One emerging area of research in the literature is the impact of internal firm organizational variables on the ability of firms to minimize the time and cost of new product development (NPD). Thus, time and cost are two important factors in new product development (NPD) process. New product development (NPD) is also defined as the transformation of a market opportunity and a set of assumptions about product technology into a product available for sale (BUYUKOZKAN, ET AL., 2004). Case studies of actual innovations showed that the marketplace played a major role in stimulating the need for new and improved products (J. POOLTON ET AL., 1998).

Market predictability, marketing skills and resources, recognition of long-term relationships, cross functional interface, compatibility emphasis, cost and service emphasis and leadership style of project manager are some other factors introduced by M. SONG, (2006) for new product development (NPD). The reduction of new product development (NPD) cycle time may create relative advantages in market share, profit, and long-term competitiveness (P. AFONSO ET AL., 2008). Empirical results suggest that successful projects differ from unsuccessful projects in project environment, skills and resources, project leadership, strategic fit, efficient new product development (NPD) process, and effective product-positioning strategies (M. SONG, 2006). Additionally, project environments including nature of market and level of competition play an important role in project success and failure. Suppliers have also a large and direct impact on the cost, quality, technology, and time to market of new products (m. primo, et al., 2002). The project leader is another factor critically affects both the process performance and the product effectiveness and facilitates communication between the project team and senior management. New product development (NPD) process proficiency and the role and commitment of senior management were key distinguishers between success and failure. In addition, good communication has been identified as critical to innovative success (M. SONG, 2006). Client supplier
collaboration is rather a complicated and difficult issue. clients (some authors call it buyers) and suppliers are facing a number of problems in managing collaborative new product development (NPD) (P. LAM, K. CHIN, 2005). Good planning is taken to include well-cost project control procedures, production planning and control, and the readiness to predict meaningful sales forecasts for new products. Good after-sales service and providing a good technical service to customers is also recognized as a factor that can cause major shifts in new product markets, especially in those industries where loss of service entails lost revenue (ROTHWELL, 1977). The importance of cumulative know-how is also critical to success (J. POOLTON ET AL., 1998). A life cycle view of a product encompasses all activities related to new product development (NPD) such as market analysis, manufacturing, design, service / maintenance, recycling of materials, packaging, distribution and many others (J HÖHNEGGER ET AL., 2007). The main factors affected on new product development (NPD) process obtained from other research are summarized in Figure No.2.

9. Conclusion:
This paper presents a high level overview and justification for analysis for engineering and launching the new product development (NPD) process to gain competitive advantage in automotive industry. The objective is to achieve a more responsive and flexible value stream, which maximizes value and minimizes the occurrence of errors and defects. Guidelines and recommendations have been provided along with a framework for automaker and its team organization. The range of methods and tools described for achieving a successful new product design on the first attempt are adaptable by any organization willing to invest time and energy in enabling such a change and gain confidence to make the transition. The ultimate goal is to satisfy or even delight the customer base with the right product variety, at the right time, at a price the customer believes is worth the investment.

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12). Developing and Managing Products, Chapter 10, Copyright Houghton Mifflin Company, users.wbs.warwick.ac.uk/dibb_simkin/student/glossary/ch10.html,


Figure No.1: Organization Form

Functional

Autonomous Team
Strong Team Leader

Weak Team Leader

[Diagram of organizational structures for strong and weak team leaders]
Figure No. 2: Effective Factors on New Product Development