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POTENTIALITIES OF PRODUCT LIFECYCLE MANAGEMENT IN AUTOMOTIVE INDUSTRY

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ABSTRACT:
The industry now concentrates on better strategies to accommodate all demands of market. Buyers want cars that cost less but come with more features. Product development in automotive industry is confronted with complicated regulatory requirements related to safety, fuel consumption, emissions, and end-of-life vehicle recycling. To address these needs manufacturers have to innovate their design and manufacture technologies. Market imposes innovation and innovation requires business processes, technology tools, and an infrastructure that supports collaboration.
KEYWORDS:
automotive industry, globalization, PLM, product information

1. INTRODUCTIONS

In just ten years, the number of new vehicle models has increased by 33%. Customers' desire for cars that reflect their life styles, together with the industry's push for technological advancement have dramatically increased the variety of vehicle types. Product life cycles are shortening while innovation expectations are rising. Customers are learning to expect greater product customization, value added extras and order change flexibility. For every operational or product improvement a manufacturer makes, the bar gets raised even higher by the demands of the marketplace. To address these needs, the adoption of the demand-driven manufacturing model requires exacting controls, such as those provided through a real-time enterprise software solution.

Business today face three on-going challenges:

- improving customer intimacy
- achieving operational excellence
- providing product leadership

Improving customer intimacy requires understanding and responding quickly to current and potential customer's needs establishing effective relationships with them, and providing consist, long-term customer value.

Achieving operational excellence requires enterprises to focus on operating efficiently, effectively, and flexibly, working with their partners to reduce the cost and time necessary to deliver high-quality products that meet their customer's requirements in a timely manner.

Providing product leadership means delivering leading-edge products and solutions tailored to customer needs.

To survive, automakers must know what the customers want, form strategic alliances to harness global expertise, and employ innovative approach to streamline production processes.

2. AUTOMOTIVE INDUSTRY AND A GLOBALIZATION

There may be no industry that has been affected by globalization more than the automotive and transportation industry. Industry analysts predict that the number of new vehicle models introduced by auto makers will increase by more than 25 percent in the first decade of the 21st century [4]. Nowadays, consumers all over the world now have more vehicle choices then ever before, and that have put tremendous pressure on vehicle manufacturers to deliver innovative vehicles with high quality as efficiently as possible (fig.1).

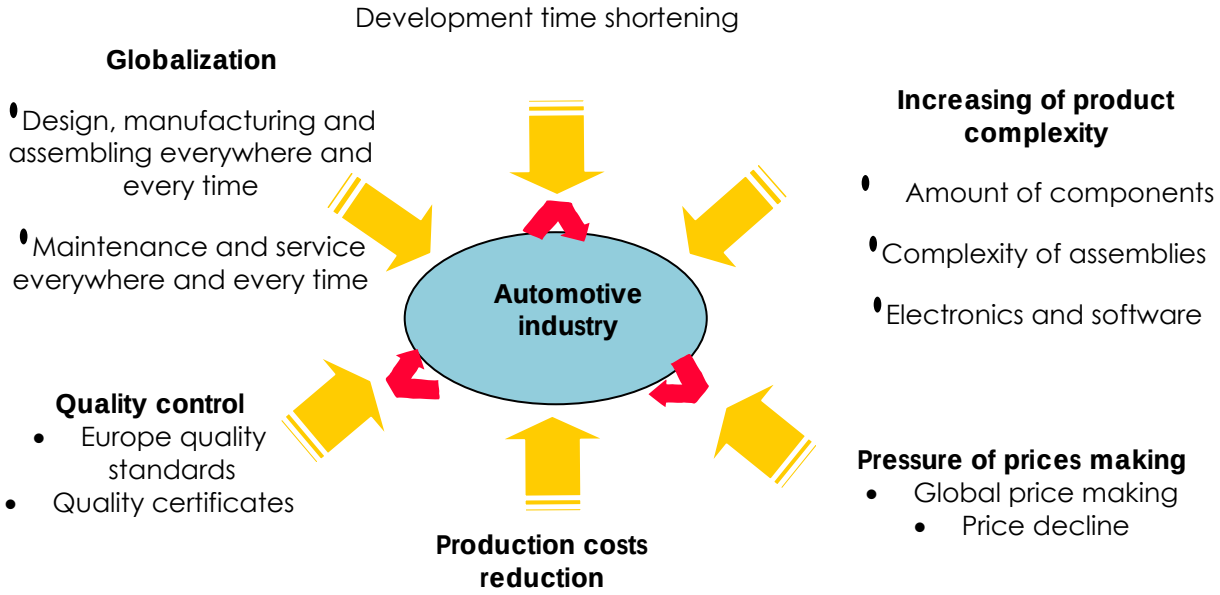

Fig.1 Impact of globalization on automotive industry

The European automotive industry is currently facing a fight for survival in the face of increasing global competition and a permanent over-supply of the automotive market. New vehicles must be launched onto marketplace with a minimum of delay. Automotive and transportation companies need to maximize the re-use of parts, assemblies and best practices across their global vehicle programs. Many are designing common architecture that can be used on many vehicle programs. Unification and re-use is a key initiative that improves ability of manufacturers to define and implement common systems, components and processes throughout their vehicle system.

It was estimated that automotive manufacturer in Europe lost US$1.8 billion in profit by being 1 year behind its competition in introducing a new model to the market. In 1989, between 5 and 15% of automobiles was outsourced, by 1996, between 40 and 80%. It is estimated, that 60% of total costs involved in automotive manufacture are costs of suppliers and service industries[1].

Automotive suppliers are struggling with the high costs of setting up operations and achieving Just-In-Time (JIT) performance levels. To ensure these levels are met,

they need mechanisms in place, designed to achieve demand-driven strategic and tactical goals on a daily basis.

In this business environment, the focus shifts from individual supply chain elements to a holistic approach that emphasizes throughput of the entire supply chain. The goals are increased profitability, greater return on assets – such as upgrades to the most intelligent machinery – and maintaining and building the customer base.

3. TECHNOLOGY "TIME-TO MARKET"

Time-To-Market is the delay between an idea, from the marketing department or a customer, to the general availability of the product. The compression of this time leads to greater responsiveness to market demand, greater market share and greater profitability. Time to market has become critical for auto companies to be successful. This has led to the development of sophisticated product simulation techniques to eliminate expensive and time consuming prototyping. It has also made collaborative design and development processes more important. Today the auto industry makes products to forecast and places it in distribution centers and dealers. Manufacturers must have good visibility into distribution and must be able to respond very rapidly to changes in production.

To speed Time-To-Market, a comprehensive approach is required. The business processes involved include many internal and external organizations (Fig.2).

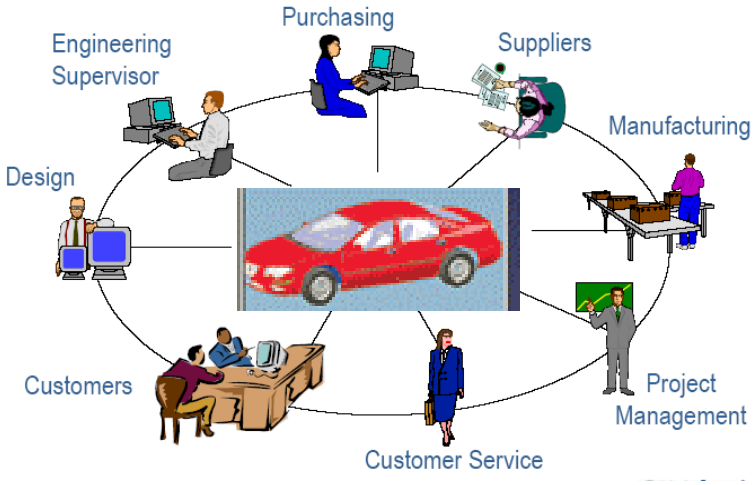

Fig.2: Collaboration and integration of internal and external organizations in manufacturing enterprise

Internal organizations often include marketing, production, quality and others. External organizations may include testing facilities, customers, suppliers, outsourced manufacturing and others. These many organizations must be managed as a single entity sharing in a single process with a single view of the product.

For this task is a transfer of technology needed. The product and processes must be transferred to the appropriate system or organization, if they are internal or external. Collaboration must take place also between manufacturers and suppliers at geographically dispersed sites (virtual teams). New information technologies and programs, based on cost-effective wide area networks and heterogeneous hardware and software platform, offers the potential for more effective and efficient synchronous and asynchronous communication and therefore better collaboration between virtual team members (Concurrent Engineering).

However, these goals are proving more difficult to achieve than was once believed. The missing element in most company's initiatives is a strategic intelligence that permeates enterprise wide tactical and operational decision-making. The right decisions are based on getting the correct data in real-time in the right format and at the right place and this can be different for every company. Furthermore, most companies use software tools at the functional level, in isolation of other interdependent departments. As a result, the improvements made in one area of the company fail to affect decisions in other area.

Successful companies have to leverage tools, such as product lifecycle management, product development management, and virtual product development to address time-to-market issues.

4. PLM –CHALENGE FOR AUTOMOTIVE MANUFACTURER

Automotive companies need to ensure that their suppliers, customers and business partners keep their information synchronized throughout the entire process regardless of organizational or geographic boundaries. To address these critical issues, leading automotive suppliers are implementing PLM system that enables companies to manage product and process information, to track project schedules, resource allocations, customers specifications and all product or process knowledge generated throughout product lifecycle – within a single information environment.

CIMdata defines PLM as a strategic business approach that applies a consistent set of business solutions in support of the collaborative creation, management, dissemination, and use of product definition information across the extended enterprise from concept to end of life, integrating people, processes, business systems, and information.

Product lifecycle management is a Concurrent Engineering based initiative that improves a design productivity and product data sharing and is seen as the leading way for this challenge. It is a collaborative product development supply system that enables manufacturer to manage a product from its early concepts to its retirement. Implementing and right using of PLM technology helps to reach an environment that ensures dispersed teams collaborate freely and confidently across heterogeneous systems with proper security and appropriate interoperability.

Managing of information in PLM system is digital. This enables designers, engineers, suppliers, partners and customers to participate in automated processes. Web-enabled PLM solutions (for example CATIA, ENOVIA, SMARTEAM, DELMIA) give automotive manufacturers, suppliers, partners and customers access to both design information and engineering data, ensuring that everyone can work together in real time virtual product development environment. Namely "Generative Car solution" developed by IBM for automotive industry consists of a set of integrated products from CATIA, ENOVIA, and DELMIA, combined with a set of best practices of CAD systems. It enables automotive manufacturers and suppliers to leverage valuable corporate knowledge in order to meet market demands for an ever-increasing number of vehicle models. It permits simultaneous engineering, fast design change, and seamless processes from early styling to manufacturing definition.

The PLM process starts with the concept design and photo realistic model rendering of the finished vehicle body, followed by manufacturing development through engineering design of the vehicle body components and assembly along with associated manufacturing tooling and finally an iterative development of the assembled vehicle body structure which is run through several FEA (finite element analysis) including static structural and dynamic mechanism kinematics analysis, NVH (Noise Vibration and Harshness) analysis, CFD (Computational Fluid Dynamics) all in a

fully associative manner automatically upgrading the engineering design and (BOM) Bill of Materials with each iterative FEA process till an optimized structure within given limits is achieved [2].

Many or all of components of that collaboration can arguably be included under the "PLM umbrella" because PLM covers all aspects of a product's life cycle, involving the entire enterprise and supply chain.

Fig. 6 Product Lifecycle in automotive industry [3]

The principle may be simple, but its implementation requires maximizing collaboration and team working between functional groups from within a company, between companies in the supply chain and between supplier and customer. Usually the first step is to take down the existing physical walls between people and move them closer together, so that they can communicate more effectively. Eventually, as the whole industry globalizes further, virtual collaboration is the aim.

5. WHY IS PLM A NECESSITY IN AUTOMOTIVE INDUSTRY?

The reasons, why is PLM a necessity just in automotive industry, are following:

- In automotive industry at any given time, there are always two-three products being developed simultaneously. A large number of designs are created, reviewed, modified and approved.
- Due to the competitive nature of the industry, the products have to excel in terms of quality and usability. Customization of automobile features is an essential part of the business practice at automotive company.
- Smallest error can mean a huge production and capital loss.
- Proper coordination between the designers, engineers and production units in the assembly line is a must.
- Collaboration across the enterprise helps catch the errors and rectify at the designing phase itself. This saves the cost and effort of repetitive manufacture of defective parts.

PLM is often thought of as a huge bundle of complex IT tools and applications which support digital design and manufacturing practices in several ways. However, this view of PLM overshadows the underlying concept of PLM which is knowledge management. Knowledge Management comprises a range of practices used by organizations to identify, create, represent, and distribute knowledge [3]. The

technology components of PLM enable knowledge creation, transformation and sharing throughout product lifecycle. The PLM environment provides the information that will automakers need to quickly evaluate previous designs and their associated manufacturing processes against current requirements – and thereby determine and facilitate re-usability. The aim is to re-use all the information that defines a product design, as well as information about how the product is manufactured, how is it performed during testing and how it complies with appropriate regulations and standards.

6. CONCLUSION

To maximize the benefits of PLM, automotive companies must align their IT strategies with their businesses, and deploy a systems engineering approach to manage the increasing complexity of future cars in an efficient way. Engineering disciplines are still required, but organizations must also implement a horizontal integration across the enterprise. The environment is complex, tasks must be sharable between experts of specific fields of work, and overall effort must meet the business objectives.

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