Metamorphosing PLM for Non Traditional Domains

Ravindra Parinam and Rajib Roy
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Abstract

PLM for long has been considered as a bastion for the aerospace and automotive industries. With the economies driven by changing consumer demands and the reduced time-to-market cycles, the Consumer Packaged Goods (CPGs) and the other product sectors have started gearing themselves with PLM offering from the vendors. The variation in the drivers for these nontraditional domains, such as the need for highly customized products, faster response to changing product requirements, supply chain issues, quicker Return On Investment (ROI) and larger successful product innovations, seek metamorphosis of the PLM vendors' traditional offerings. These domains represent huge mix of products with their unique challenges to be addressed for PLM implementation. The issues facing these domains have been classified into two categories (1) based on the process specific challenges (viz. food, pharmaceuticals, apparel, construction etc) (2) based on the business models for the branded, non-branded and online goods which have varying issues in the integration of processes between the manufacturers and the retailers. The unique details of each of these are discussed. Some of the possible ways for the PLM Vendors in addressing the challenges by focusing on the areas such as the information management of product data, on-demand solutions for rapid deployment, feedback information from product realization and traceability, supplier contributions have been analyzed.

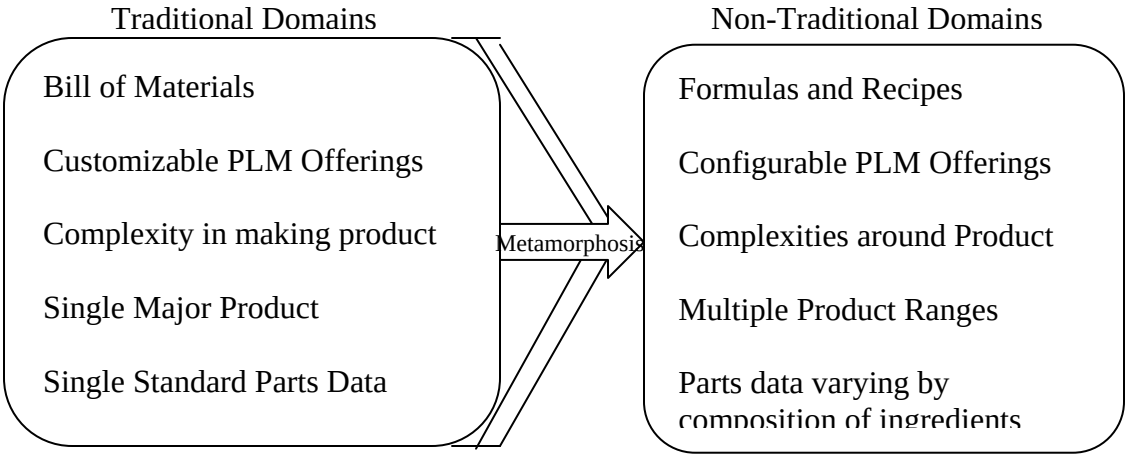
Understanding the Need for Metamorphosis

The implementation of PLM solutions in the industries, which started on Product Data Management (PDM) foundations, was mostly restricted to big discrete manufacturers in the fields of automotive and aerospace industries in late 90's. The process industry largely remained elusive to the benefits offered by PLM. Increased need for quicker response to customer demands, global collaboration, improved product quality and need for adhering to regulatory compliance have made CPG's and other process industries to focus attention on PLM. Companies such as Procter and Gamble started embracing PLM solutions offered by companies such as UGS.

The big and strong players (such as UGS, IBM-Dassault Systemes etc) providing the PLM/PDM solutions are well established in their "traditional areas" of aerospace and automotive sectors. In order to cater for the process sectors (Non Traditional sectors), these solution providers must first understand that this sector presents its own set of unique requirements and inherent variability in processes. The PLM solutions provided should free themselves out of their traditional cliental requirement mindset and understand the highly domain specific requirements of the CPG's. Some of such variations in the requirements and transitions from traditional to non- traditional domains are listed below.
a. The build of the products should be based on formulas and recipes in process sector as opposed to the Bill of Materials (BOM) in engineering product structures.
b. The concept of product data management has to expand from engineering department vaulting CAD files, to a system to record all product information across the entire organization - through manufacturing, quality and supply chain.
c. As the lead and response time to changing requirements is much lesser in CPG and other

process areas, the offerings should be more configurable (i.e. more out of the box solutions) as opposed to more customizable offerings in the traditional discrete areas.
d. In discrete manufacturing the complexities involved are in making the product itself whereas in process areas the complexities are around the product making, such as labeling and packaging issues, brand management issues, well-coordinated worldwide product launches.
e. The products itself may have multiple product ranges in CPG's, as opposed to a single major product in manufacturing industry.

Thus we see the need for metamorphosing the PLM offerings to cater to the “Non-Traditional” clientele.



In addition to the above requirements, there is also a need for understanding that each of the process industry players such as Food, pharmaceutical, apparel, and construction has hugely varying key drivers, which need to be addressed by PLM. The business models of these players - branded, non-branded and online goods also need to be understood for the PLM offerings. These drivers along with some of the ways to address them have been discussed below.

PLM FOR FOOD INDUSTRY

The implementation of PLM specific to food industries will involve managing of the following categories: Product Data Management, Specification Management, Formulation and Recipe Management, Product tracking, tracing and genealogy, Product Quality Management, Laboratory Management. The most crucial among these seems to be the specifications management.

Importance of Specification Management: The product specification repository is an important and essential one in food industry for maintaining and managing specifications for number of purposes. These include specifications for sales and marketing, R&D development specifications, production processing parameter specifications, customer specification for products, ingredient specifications and standardization and label statements. Better management of these product specifications will lead to reduction in inventory and better profits.

When food companies try to deploy global food brands across the globe, they face challenges in deploying the standard specifications and formulas specific to the country. The recipes vary in order to meet the tastes and preferences of the local markets. While providing global solutions, the local languages, culture, regulatory environments must be taken into consideration. The solution should recognize the fact that same product could be produced from a slightly different recipe based on local tastes. The PLM solution should view this as the same product with concurrent level of revisions.
Also the need for multiple labeling requirements, based on nutritional information for the local markets, is emphasized for global deployment. The labeling information changes, based on the

nutritional, allergen and ingredient information, mandated on the labels as per local laws.

Another atypical requirement in the food industry is the variation of material or ingredient specification when considered as an individual entity as opposed to the specifications when the same materials are mixed or cooked. That is to say, there is a variation in specifications when the materials interact with each other and these need to be accounted for while developing a solution.

In food industry, it is very difficult to maintain and obtain exact specifications as mandated, since most of the ingredients involved are grown in farms. It's a hard proposition to have the produce that meets the exact specifications. Hence the solutions should provide a common way to compare the specifications from the required figures to provide just the right balance.

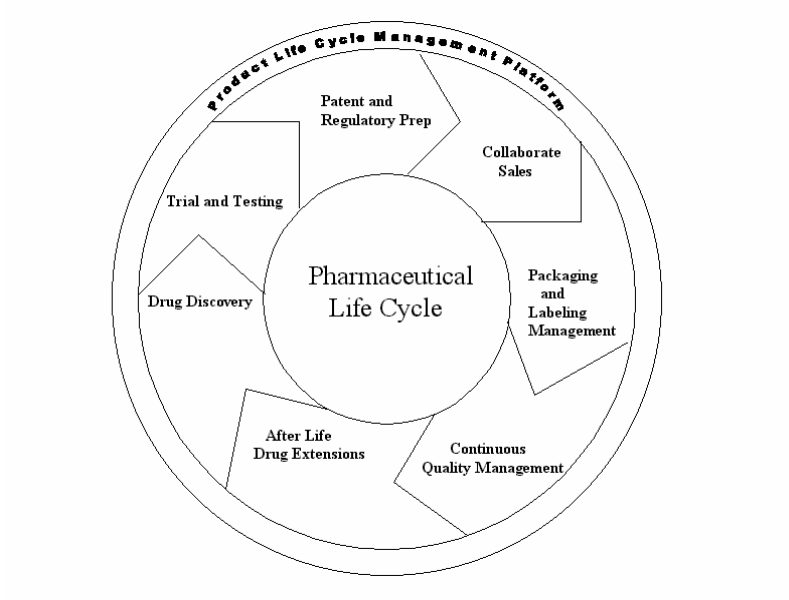
Product Life: The food being sold at retailers have typically very short shelf lives because of their ingredients. The varying consumer tastes makes it all the more essential to manage for quick transitions. The concept of Just-in-time manufacturing addresses this need and is very critical factor for food industry. The recipe management functionality in the PLM should be robust enough to handle the situations for quick turnaround and in-time manufacturing. Implementing global recipe repositories will help change management to formulations in centralized environment.

New Product Development: Another area of the food industry presenting challenges to PLM solutions is the new product development. In food industries where innovation is constant, around 70-80 percent of all new products generally fail. The need for successful research projects, with faster trial and error process is crucial in cutting down the expenditure. PLM solutions should help by providing centralizing and in-control mechanisms to help speed the trial and error process, by rapidly cycling through the process.
New recipes are obtained by tweaking the existing recipes to get new products. Having formulas and past trial errors in a central repository would allow the manufacturers to handle new product requests more efficiently by calling up past experience.

Product tracking and tracing: Having mechanisms to track and trace the items throughout the food life cycle is very vital, especially for product recalls. In contrast to the regular automobile recalls, the recalls for the food should be acted upon very quickly as it generally affect the health of the people consuming the product. The RFID concepts coupled with PLM solution should help in identifying the product down the food chain in a matter of hours.

Pharmaceutical Industry

In the present day scenario, pharmaceutical companies face the pressures to improve product pipelines, competition from generics, accelerate time to market while maintaining strict adherence to quality principles and regulatory requirements. New drug development is a long and lengthy process which can take anywhere between 10 to 15 years, with a significant risk of no returns on the investment. To add to these pressures, the patent expiration within few years from the launch of the drug can make the drugs face stiff competition from generics and also lose the advantage of patent protected pricing. It is believed that a single day reduction in development process can provide close to $2.7 million loss[1] in sales for some highly popular brands of drugs. Hence the time to market is of utmost importance in the pharmaceutical industries. PLM solutions specific to this industry must definitely take up this factor as a prime one.
The specific requirements of this industry can be considered from its life cycle. The life cycle of typical drugs consists of the following stages - a) Drug discovery phase b) Trial and testing phase c) Patent and regulatory preparation and submission d) Collaborate with suppliers and co-ordinate sales e) Packaging and labeling management f) Continuous quality management g) Prepare product after life with drug extensions



Drug discovery consists of experimenting with lots of compounds and involving collaboration in the form of research networks. The previous results of experimentation need to be leveraged easily. Hence the need for a repository of old results as well as having the information on ingredient properties (like ph, viscosity etc) and their chemical interactions is needed. The ability to weed out the non-performing compounds out of the lot, in the early stages of development, is essential.

The pre-clinical testing and patent regulatory preparation-submission are considered to take the maximum amount of time during drug development. This can range from 10 to 12 years in a 15-year phase. Pre-clinical trials on animals need to be interpreted for humans and documented. There is a major emphasis on applying for patent application and adhering to regulatory compliances before FDA approves the drugs. The PLM solution should make applying for these, as part of their standard offerings, as these applications can take a significant amount of time.

Having global suppliers coordinating many major developmental efforts, the need to collaborate information with necessary security is important. PLM offerings should be able to provide this collaboration along with global change management.

Once the product is released to the market, packaging is considered to be the most vital criteria for determining the profitability. It is estimated that up to three fourths of product cost is from packaging and labeling process[2]. The geography specific requirements on the packaging, along with the regulatory restrictions, product safety, and multiple language and counterfeit controls can significantly jack up the price of the drugs. It is also essential to manage the packaging information, for quick changes during product recalls. It is estimated that up to forty percent of drug recalls are due to packaging issues[2]. Having affective packaging requirements suites as part of PLM offering is of importance.

For maintaining the quality and fixing the issues quickly, many pharmaceutical industries implement continuous closed loop quality audits. The PLM offerings should be able to manage these audits and provide feedback on quality problems to the stakeholders.

Once the products have attained maturity, the pharmaceutical brands need to come up with brand extensions in order to sustain the market for the brands. Otherwise they may quickly be replaced with generics in the market. Having an effective PLM solution that can address successful changes to the brand formula may leverage brand extensions.

Apparel Industry

The Apparel industry poses perhaps the maximum amount of challenges when it comes to customer satisfaction. Customer taste is most diverse in this industry and it's really difficult to find out a single solution that caters to many customers. As the demand for varieties being more in this industry, keeping the pace with ever changing customer tastes and latest fashion trends is a major prerequisite. The typical life cycle here begins with, conceptualizing a new product by identifying the flavors of the season, which are then transformed as the specifications for concepts. Once a logical grouping of the specifications is made, effort is made to map these into manufacturing requirements. After the manufacturing stage, the new products are released in the market. PLM should be helpful in effective tracking of the information right from the conceptualization state to the final release stage. It should be able to track the information on raw material development, colors, style, color and lab dip approval, vendors and costing data.

As the new product development generally takes about 12-15 months of time in this industry, it is rather difficult to project prevalent trends at the time of garment's introduction. A late start in conceptualizing the latest trends for a season gives the advantage to understand the persistent trends better. This would enable more accurate alignment of seasonal product with the current market trends. On the other hand a late start can also mean delayed time-to-market resulting in huge losses. PLM solutions should enable this delay in the starting time and yet eliminate the delay in the time-to-market. The important essence for this industry is in the fact that the fashion trends should be accurately identified as early as possible and the product should be in the market before the fashion is out. PLM offerings should help in analyzing the trends from the past data to reduce the product cycle time considerably to ensure the products are in the market on time.

Construction Industry

The construction industry is in general very fragmented. This is one of the prime reasons that PLM has not been as strong in this domain as in Automotive and Aviation. The various players in construction management have their own information systems without proper integration, thereby significantly reducing the capability to share and communicate. Work is still done extensively based on paper and voice communications. Maintaining schedule is the most critical issue in construction. A slip in the schedule would not only mean delayed project but immense financial losses. PLM strategies should effectively integrate information across the various departments like architectural and engineering department, architecture, consultancy, suppliers, contractors, sub-contractors, inventory management thus enabling them to work as a unitary entity. It should be capable of implementing information infrastructure to form a virtual construction enterprise, where the information can be made available to geographically scattered partners throughout the project life.

Business Model of the CPG's

In addition to understanding the requirements specific to an industry as discussed above, it is advantageous if they can be sub-grouped based on the business model they adopted and understand their drivers. The business models have been classified as I) Branded ii) Non Branded and iii) On-line goods.

Branded Goods

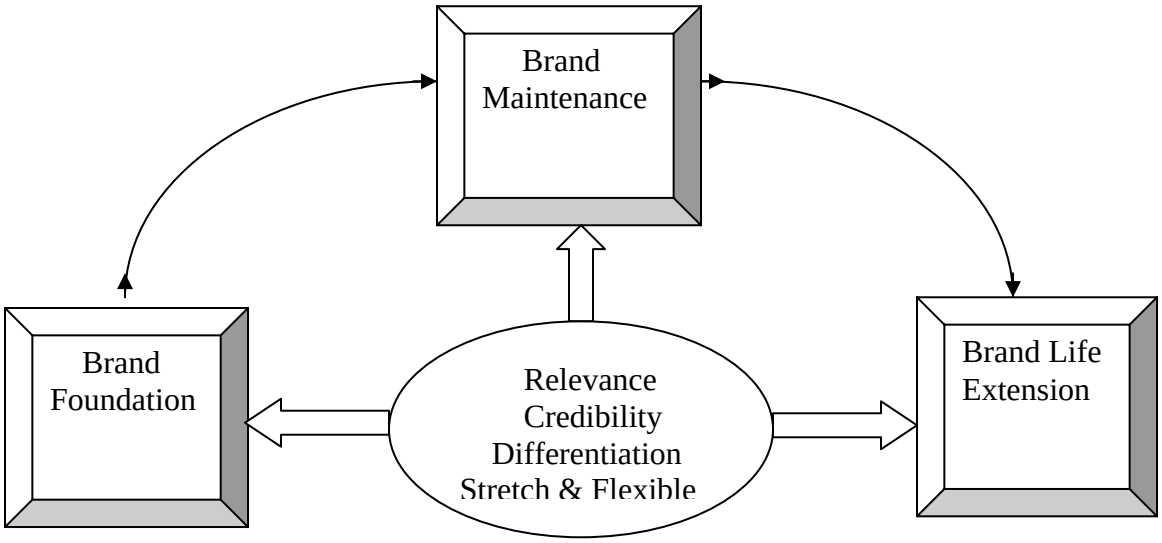
The lexicon definition of a brand states that brand is an identity created for being instantly identified by consumers and distinguishable from other products in same genre, and more easily linked to market. The brand image and value have very high stakes in product being offered. The life cycle of the branded products have their own unique and distinct attributes which needs to be

addressed while implementing PLM. A typical life cycle of the branded product has the following stages:

i) Laying the foundations for the brand by the manufacturer
ii) Brand maintenance
iii) Extending the brand life.

The laying of the foundation starts off with development of the brand, having perception for the requirements in the market and establishing clear vision of the product. Determining the brand development start off point is very crucial for making or breaking a product. Starting the brand development process, with the laying down of vision, at somewhat later stages can make the product miss the target launch times. Unless there is clarity of the brand propositions and consistency in communicating of this brand proposition across all channels of the brand viz. advertising, sales, public relations, packaging etc, brand development at early stages also has reasons to fail. PLM initiatives launched upfront in the early stages of brand foundation will pave the way for fulfilling the above requirements.

In addition to this, PLM needs to address the 4 key factors, which constantly need to be evaluated at each of the three stages of the brand life cycle. These are the a) Relevance, b) Credibility c) Differentiation, d) Stretch & flexibility



Relevance: The relevance of the brand with respect to unmet needs of the market, and with end users demands needs to be evaluated. This calls for effective gap analysis of the current market needs and what it is able to provide. Previous data/reports and information plays a crucial role in this. PLM should be tuned for capturing repositories for past data/reports as well as to capture the new trends and requirements in the market effectively.

Credibility: Develop and maintain the credibility of the brand, by instilling the faith for the manufacturer's branded product. Brand Cues and Communication needs should be collected and be credible enough across all target stakeholders.

Differentiation: The differentiation of the brand with generics and other brands is also of primary importance for sustaining brand name for life. In today's market, any brand needs some special qualities to make it stand apart in the overcrowded market. This calls for realization of "value added features" to the product through innovation. PLM implementation must be effective to get the innovation at work by sharing the information across the team.

Stretch & Flexibility: Branded products market must be accommodative enough to intake and reflect the changes in the market demands in short duration. The PLM implementation, similar to the process specific industries, must capture the requirements.

The second stage of the brand cycle is the time the brand is released to the market and product is around the maturation stages. The focus here is for the retailer to sustain the market for brands to attract customers even though his profits are low. Constant product innovation is necessitated once the product hits this stage as the manufacturer is driven towards this both from varying customer demands and increased competition of private label manufacturers who bring cheaper, better product alternatives for the same brand. At the same time manufacturers of these branded products tend to get a direct feel of the market with factory outlets selling directly to customers. All of these varying consumer preferences and direct feedback from consumer purchase at the outlets need to be captured effectively.

Extending the brand life, by providing line extensions, next generation of products is gaining importance in branded goods. As brand name is always consistent across all the three stages of life cycle, providing the extensions of this brand should milk its advantages. The four key factors, as stated above, need to be re-evaluated, before coming up with the extensions, so that undue damage to brand name itself is void.

The need for a PLM setup addressing these various factors and scenarios will help a long way for successful brand realization.

Non-Branded Goods

The private label or non branded goods are the replacement substitutes of the generic brands, offering products at more profitable margins to retailers and most of the times with better quality than the branded goods. In recent times, many national retailers have realized the full potential of these goods and are stocking them up in large numbers. In Europe the super markets are selling as much as 45% of their products made by private label manufacturers[3]. With such large volumes of these goods produced, and having different set requirements from branded sector, it is advantageous if PLM can address the needs specific to it.
The private label sector is centered on the Retailer. Even though this sector has the traditional Manufacturer-Supplier-Retailers as the players, the Retailer mainly drives the sector. Retailers have the onus of capturing the market needs in time and conveying it to manufacturer. They have the primary responsibility to market the products, managing the right product mix of branded versus non-branded to attract the customers, and sell the private labels.

Contrary to the life cycle of branded goods, the unbranded sector has complex union of various life cycles to manage. The cycles involved are the retailer-manufacturer cycle, where the retailer is driving the requirements with the manufacturer and getting them in time. There is manufacturer-supplier cycle, where the manufacturer needs to have its own demand-supply cycle from its suppliers. With more retailers bringing out their own store products, the retailers are turning into quasi manufacturers themselves. This further adds more complexity to the retailer, as now it has to manage the manufacturing aspects themselves, which were hitherto domains of only manufacturers. There is so much information transfer at stake and having centralized repositories with the help of PLM platform is vital.

The three main important factors in Non-Branded sector where the PLM can play major role are
i) Innovation
ii) Time to market
iii) Better quality at lesser price.
Non-branded goods are continuously driven by the new innovations in product, process and organization for improving competitiveness and overall business performance. Collaborative innovative environment is very march part of the system, involving players across the globe and leveraging of the intellectual assets of the enterprise to the maximum potential.
Due to constant flickering in the customer choices and buying preferences, Non-Branded goods, which thrive mainly because of directly addressing customer needs rather than brand value, must be agile enough to respond very quickly to customer's demands. The need for faster time to

marketing of products is all the more important. The proximity of retailers to customers provides added advantage in making changes to design and marketing strategies.
Non-branded products which offer equal or better product quality at lesser price, are the ones well appreciated by the customer demand. Having systems in place to have risk assessments, emerging trends and regulations captured in a central common repositories and having common communication platforms goes a long way for sustaining in markets.

Online Goods

Online goods, which are manufactured from the orders of customer, follow a completely different model from branded/non-branded goods. Unlike branded and non-branded goods, which are generally first manufactured and then marketed; online goods are mostly marketed first only to be manufactured as per customer requirements. Customer demand forms the core of this model. The sales made on the Internet allow customers to choose from a flexible configuration and a variety of products. The need for getting all the requirements of customer, from the web interface and converting them into manufacturing requirements is very much the need for this industry. PLM systems in place should be capable of catering not only to the back end manufacturing needs, but must integrate with front-end customer requirements gathering and interpolation. This will have two distinct advantages. First, as the user requirements are directly fed into the PLM, possibility of data variations from actual requirements will be less. Secondly, PLM solutions will speed up the life cycle substantially as intermediaries are minimal from requirements to marketing stages. Any configuration changes from the user can be communicated to the manufacturing, in the fastest possible time. Also as online retailers provide the maximum flexibility in configurations to choose from, a balance between cost considerations and what the customer needs is essential. PDM should function as a single repository of information for order management, payment processing, warehousing, transportation & delivery, and customer service as well as the link between the front and back end.

Supplementing information management to PLM for CPG's

The traditional concept of PLM encompasses everything from gathering early requirements for a product through multiple stages of product design, realization and commercialization to eventual product retirement. Based on the experiences of discrete manufacturing industries where major focus is on the design phase of the cycle, the PLM offerings, which spun off from these domains to cater to CPG's and other process sectors, have more emphasis on the front-end (Pre-Product launch phase) part of the product life cycle. There is a great deal of emphasis on recipes, specification, and technical product changes. There seems to be lesser focus on the commercialization aspect of the product where the actual profits are realized. Although PLM solutions can store item data, they are not well designed to synchronize and translate product information between company's internal and external systems.
Product information management or PIM focuses on gathering and managing product information from multiple data sources such as companies ERP, Suppliers ERP, CRM etc. Product information is managed throughout the enterprise and supply chain to improve product-related knowledge management, information sharing and synchronization.
Standalone PIM solutions, such as Apsiva seem to provide the ability for the technical characteristics of the product being expanded to extract the commercial information such as pricing, promotional information and other commercial data needed in CPG sectors. They collect and rationalize commercially oriented product data from disparate enterprise systems. They also help in synchronizing product information between internal manufacturer’s systems and external trading partners. This leads to overall supply chain efficiency and meeting customer demands. Information management initiatives by the CPG’s such as synchronization with EAN/UCCnet, Global data synchronization (GDS) are steps in this direction. These information management systems provide complimentary capabilities to existing PLM implementations for CPG’s by aggregating information within PLM and other data source and actively extending this information throughout the enterprise and supply chain for improved efficiency and communication.

On Demand Business Solutions

In recent times as an alternate to far lengthier, difficult and costly implementation of client/server-based PLM solutions, On-Demand solutions, such as “Arena” are sprucing up. The On-Demand is a PLM solution provided over the Internet to the clients, which is hosted, maintained and supported by the solution provider on their own servers. This in effect means PLM service requires no infrastructure or software installations by the customer. The PLM is accessed through a standard web browser that makes global teams to instantly and securely collaborate and share real time product information. This kind of solution is very suitable for small and medium businesses who can leverage advantages such as low up-front costs, minimal internal IT support requirements, near-instantaneous deployment giving fast time to value, and easier collaboration. In consumer goods and other industries, as noted earlier, flexibility and speed to customer needs are very vital and have to be quick enough. This solution offers one of the fastest ways to implement PLM and get quick turn around time. With solutions propagating subscription models, companies pay only for the services used as-on need basis saving them huge amounts. The ease of deployment, operation, maintenance and upgrades, latest technology, all of which being handled by solution provider themselves, it seems there is nothing to lose and only leveraging the advantages of PLM for the customer.

Feedback info from product realization

Extended customer support has been an integral part of all product life cycles. This refers to the providing support to the customer once the product is sold. The promptness of a satisfactory response depends on how efficiently the customer feedback is processed. One possible way of handling this maybe to route the issues through the chain of groups from customer support till the designer of the product and come up with the solution. Yet another way would be to provide access to the issue details to multiple groups simultaneously, including suppliers who are involved with the problem. This would help in getting a solution closer to the customer expectations in a shorter period of time. In CPG’s where this need is all the more great, PLM should be used as the machinery to share this customer concerns amongst the various groups and to merge their feedback.

Product variations are quite common to meet the ever-changing customer tastes. The feedback chain hence is the most crucial link to verify whether the variations are being received as expected. Trace ability of the product acceptance, to the product conceptualization and design needs to be maintained.

A customer complaint can also be viewed as an opportunity to get closer to the customer, to know him better, which in turn would help in a better product. A complaint, which first looks like a repair issue, may turn into a bright idea. When a customer specifies a desired feature, which is not there in market, it can be a prime opportunity to gain competitive advantage by being the first-to-market with the required feature. All these in turn call for a seamless flow of information across the supply and demand chains-from customers to suppliers to product designers. PLM should enable full integration across functions, applications and processes to realize an efficient feedback information and traceability.

Conclusions

The above discussed points brings us to a conclusion that there is no one solution that ‘fits for all’, like auto or aerospace. The ability of single PLM vendor offering all possible resolutions, to every industry type in the CPG sector is not feasible. The ultimate choice of vendors depends on type of CPG sector and business model. The venturing by the existing big PLM vendors into these CPG sectors will make them less dependent on big 2 sectors (auto and aero) for profits, and at the

same time enable CPG's to gain the advantages of PLM. But to achieve this, PLM vendors emerging from CAD roots need metamorphosis to gain the domain knowledge and understand highly varying industry specific requirements. By coming up with solutions which provide quicker 'Return on Investment (ROI)' and easier setup and maintenance, stronger and quicker customer feedback realizations and information management systems, these PLM solutions will be able to cater CPG's more effectively.

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