Revitalizing Product Life-Cycle Decision Making

Economic, demographic, and competitive realities have contributed to creating a challenging environment for product companies. More than ever before, companies are hard pressed to make highly effective product-related decisions that deliver innovative, high-quality new products to market. Facing stiff competition from low-cost regions, product companies must also deliver differentiating, price-competitive products to market faster.

THE CHALLENGE OF MULTIDISCIPLINARY DECISION MAKING

Effective product development demands that companies excel in efficient and impactful multifaceted and cross-disciplinary decision making. However, the traditional organizational structures and product development methodologies cannot always meet these new challenges. They follow a linear path in which decisions are made within traditional development disciplines: market requirements, design and engineering, manufacturing, and service.

This linear, forward-feeding flow of product information and decision-making process emphasizes individual task performance and is optimized to meet the goals and address the constraints of a given product life-cycle phase. For instance, a system designer may select the design and components best suited to the functional requirements of that system but may not be aware that the components are expensive and in short supply. Likewise, supply chain planners focus on identifying lower-cost suppliers, but lacking insight into the design requirements, the planners choose suppliers that may not be able to meet quality and delivery expectations. Consequently, these two well-conceived decisions end up being at odds with each other, a fact that is not immediately apparent to the individual groups. In like manner, downstream activities such as supply chain and service planning often are treated as afterthoughts and commence late in the product life cycle, at which point the ability to influence already made decisions is reduced.

OPTIMIZED, INDIVIDUAL DECISIONS THREATEN BUSINESS GOALS

Product life-cycle decisions that are made independently of each other may be highly optimized individually, but collectively they contribute to an overall suboptimal product life-cycle design, leading to delays, cost overruns, and subpar quality.

All too often, lack of visibility into downstream activity or lack of clear understanding of the higher, business-level goals that could be achieved by decisions made in the proper context results in a correct decision made within one product group, one location, or one discipline jeopardizing the ability of a downstream group to accomplish its objectives.

Informed decision-making calls for the involvement of and input from different disciplines within product development and, often, stakeholders from different product life-cycle phases. However, achieving this level of process maturity is fraught with challenges. Often, decision makers in one area do not have adequate visibility into and comprehension of the impact their decisions may have on downstream activities such as manufacturing, service, warranty costs, and total cost of ownership.

QUALITY AND SPEED OF DECISION MAKING IMPACT MARKET SUCCESS

Market success depends significantly on the quality and the speed of product-related decisions, and companies that do not excel in managing those decisions — and the information that is used to drive correct decisions — are frequently disillusioned when products fail to meet expectations.

By now, most organizations have recognized that many decisions concerning downstream processes must be incorporated into early design decisions, lest late changes become prohibitive. Nevertheless, many organizations do not possess the process maturity and required tools to incorporate multidisciplinary decisions early in the product life cycle and downstream.

By definition, multidisciplinary decisions involve multiple stakeholders and decision makers who make many critical decisions throughout the entire product life cycle. These individuals not only have different — and sometimes conflicting — business goals but also often have different backgrounds, training, and skills. Moreover, as product companies become more global, targeting new markets and capitalizing on resource pools in lower-cost regions, language and cultural differences further impede effective and consistent decision making.

Another dimension of complexity that eludes many product companies is that experienced workforces in mature regions are nearing retirement. Organizations that have traditionally relied on the voice of experience, even if it is expressed in an ad hoc and unstructured process, as it usually is, will have to seek alternate and more formal means to effect product-related decisions.

MULTIDISCIPLINARY DECISION MAKING REQUIRES A COLLABORATIVE PLATFORM

The complex and iterative nature of multidisciplinary decision making necessitates information and workflow that are difficult to accomplish using the fragmented IT environment that typifies many product companies. Many organizations employ a heterogeneous set of data stores and tools (e.g., CAD, PDM, ERP), as well as task-specific tools such as simulation and analytics, and myriad individual documents and spreadsheets.

To successfully tackle today's challenges, product companies must equip their workforce with enhanced information technology platforms that not only support but also encourage high-level collaboration and effective decision making. Such a platform would deliver profound product detail — both business and technical — that would present complete, accurate, and up-to-date context for effective decision making to all users across disciplines including marketing, engineering, procurement, manufacturing, and service. Of comparable importance, this platform would be equally valuable to users independent of their technical skills, experience, and language.

Research shows that making extensive use of visually represented information helps even the playing field for cross-disciplinary decisions — even more so when skills, culture, or language differences might play a role in the fidelity of these decisions.

VISUALIZATION SIMPLIFIES ACCESS TO AND UNDERSTANDING OF INFORMATION

Visualization is especially effective in synthesizing different data sources and assessing the cross-domain relationships and impacts of product-related decisions. Visual representation of product information facilitates effective communication of complex data to technical and nontechnical participants and allows for the inclusion of a wide range of stakeholders in the decision process. For example, personnel can easily identify out-of-compliance parts in an assembly or measure the ergonomic impact of a product or a process on manufacturing line personnel.

Essentially, visualization simplifies access to information by decoupling the intimate product knowledge and skills required to use complex tools from accessing information and applying it to decision-making activity. The intuitive aspects of visual data representation take on more of the burden of bringing to the foreground information that is relevant to a given user's role or task. The visual delivery foundation is more proactive and less dependent on the user to search and find information. Product companies must make access to product information straightforward; for instance, product data housed in a siloed standalone database maintained by a single group (e.g., product engineering) is no longer acceptable.

VISUALIZATION BEYOND ENGINEERING 3D IS REQUIRED

Obviously, visualization is not limited to the engineering 3D view of product structures. Rather, it must be inclusive of the multiple kinds of data that are essential to achieve high-quality decision making in every phase of the life cycle of a product.

While the utilization of traditional design and engineering tools will continue, these tools must be augmented by additional technologies that allow for more comprehensive data analytics. Furthermore, more comprehensive product knowledge will be accessible to a broader circle of stakeholders from across the life cycle, allowing for discovery of issues far earlier in the product life cycle, when such issues are significantly cheaper and easier to resolve.

REQUIREMENTS OF A COLLABORATIVE PLATFORM FOR DECISION MAKING

An archetypal decision-making foundation is a platform and workflow that span multiple product life-cycle phases, tools, and data stores. This foundation should:

- **Provide access to and visibility into all aspects of the product life cycle** from a heterogeneous set of data stores and tools, including both formal and ad hoc methods. Moreover, the open nature of this platform ensures that as organizations mature, reduce IT fragmentation, and adopt new tools, decision makers will continue to have effective access to them.

- **Support intuitive and effective data navigation** that does not require deep understanding of product structure. Moreover, such a platform should provide a dynamic and flexible navigation paradigm across life-cycle disciplines that fits individual task performers. For instance, users can switch from navigating by product structure, which is an engineering paradigm, to supply chain–centric navigation, traversing parts from the same supplier or that have a suboptimal cost-quality ratio.

- **Improve organizational ability to analyze, understand, and act** upon product-related data. Mashing up data, regardless of the source and semantics, opens the door for whole life-cycle analytics and what-if scenarios that are impossible using individual tools. When combined with flexible navigation and presentation methods, those analyses can be converted from complex static reporting to an environment that delivers visual cues that enable background analytics and monitoring processes to inform users where decisions need to be made or provide guidance in making the best context-rooted conclusion.

- **Protect and reuse corporate memory.** Many product organizations do not have the means or the culture to capitalize on the vast experience gathered throughout the development of other products. As a result, they often waste valuable resources resolving issues that could have been avoided in the first place. A platform that guides decision makers by discovering and exposing company knowledge and best practices would improve the fidelity of decisions during development phases and accelerate the resolution of unseen problems, which will then be available for other constituents and future products.

- **Facilitate a platform that engenders cross-disciplinary collaboration.** Product companies are faced with many options related to user interfaces. While some interfaces are designed for engineering disciplines, others may be better suited for service personnel. A collaboration platform not only must be widely usable but also must encourage interaction, sharing, and collaboration between departments and corporate disciplines, potentially extending beyond corporate walls to partners and suppliers. A user interface that is fundamentally built around visual information and is adaptable and easy — perhaps even fun — to use helps decouple specific tools and processes from the decision-making activity, helping individuals achieve a higher level of decision integrity. The interchange of timely information between users and groups will help promote agility and confidence in the decision-making process.

COLLABORATIVE DECISION-MAKING PLATFORM FORMS THE FOUNDATION FOR NEXT-GENERATION PLM

IDC Manufacturing Insights recommends that product companies implement an enterprise product information strategy to improve collaboration and decision making, supported by a software platform that connects the different tools and data stores. The decision-making platform will facilitate effective and secure access, making product information available and understandable to all participants in product life-cycle decisions. Furthermore, we believe possessing such a decision-making platform represents a source of future competitive advantage.

It is our belief that product companies that facilitate this approach will establish a more complete context for understanding all phases in the design cycle. This platform forms the foundation of the next generation of enterprise PLM, incorporating portfolio-level decisions, past best practices, and reuse opportunities as essential capabilities. We anticipate that this platform will help product companies:

- Capture and validate decisions against the appropriate rationale to ensure a more complete impact assessment and make decisions sooner with a higher level of confidence

- Accelerate business processes and approval cycles to reduce time to market and reduce costs

- Improve total life-cycle quality, costs, and customer satisfaction, which in turn enhances brand image and market position

- Improve speed and accuracy of decision making, especially in processes that today lack reliable context or are reactionary and created under time pressure