

Addressing ‘Enquiry Management’ Challenges of ‘Engineer-to-Order’ Manufacturing by Leveraging PLM

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Abstract

While working with several ‘Engineer-to-order’ (ETO) manufacturing organizations, the author has realized that there are several challenges particular to this industry that need to be identified and addressed separately. One of the biggest challenges lies in ‘Enquiry Management’. This paper addresses enquiry management challenges and offers solutions on how Product Lifecycle Management (PLM) can help mitigate these issues.

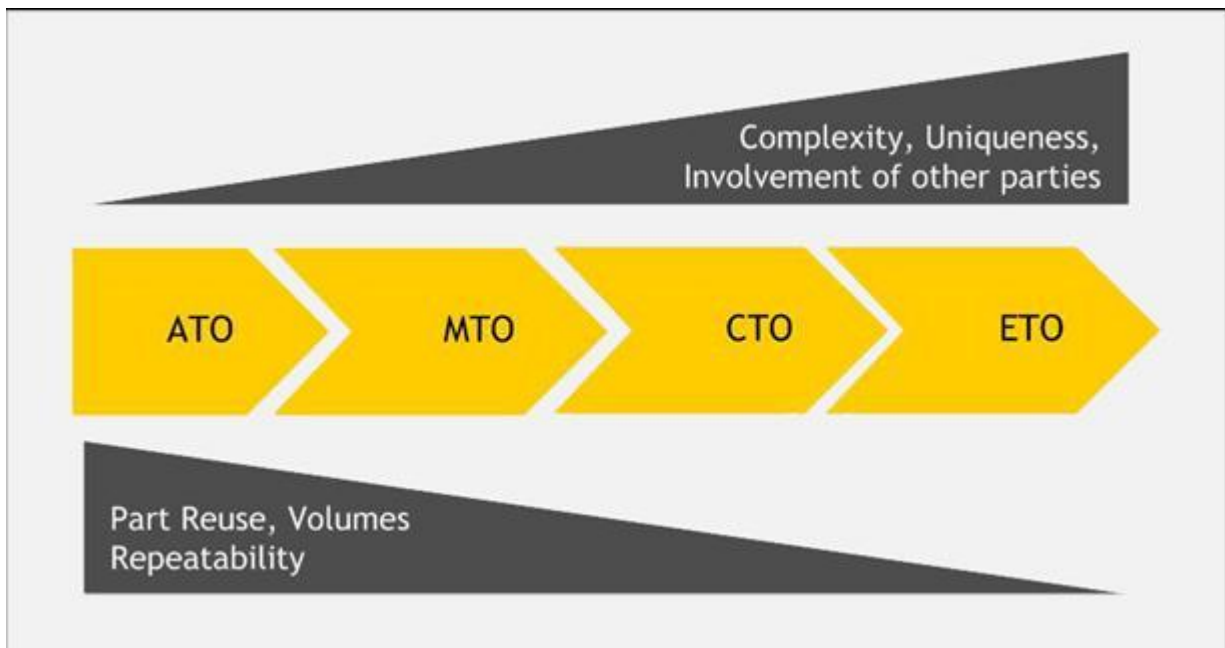
ETO Manufacturing Industry Scenario

The project-based manufacturing sector is an industry driven almost exclusively by customer requirements. Other characteristics of this industry include:

- Big turnkey capital goods projects including physical plants, buildings, infrastructure projects and heavy equipment production
- Project-oriented organizations typically produce deliverables with continuous input from the client, partners and suppliers
- Project-specific relationships with unique engineering, manufacturing, finance, and operations characteristics
- Winning these contracts depends on competitive bids and articulating project requirements.

This manufacturing industry sub-sector has four major production strategies: Engineer-to-order (ETO), 'Configure-to-order' (CTO), 'Make-to-order' (MTO) and 'Assemble -to-order' (ATO). While production complexity is least in the ATO scenario, it is most significant in ETO scenarios.

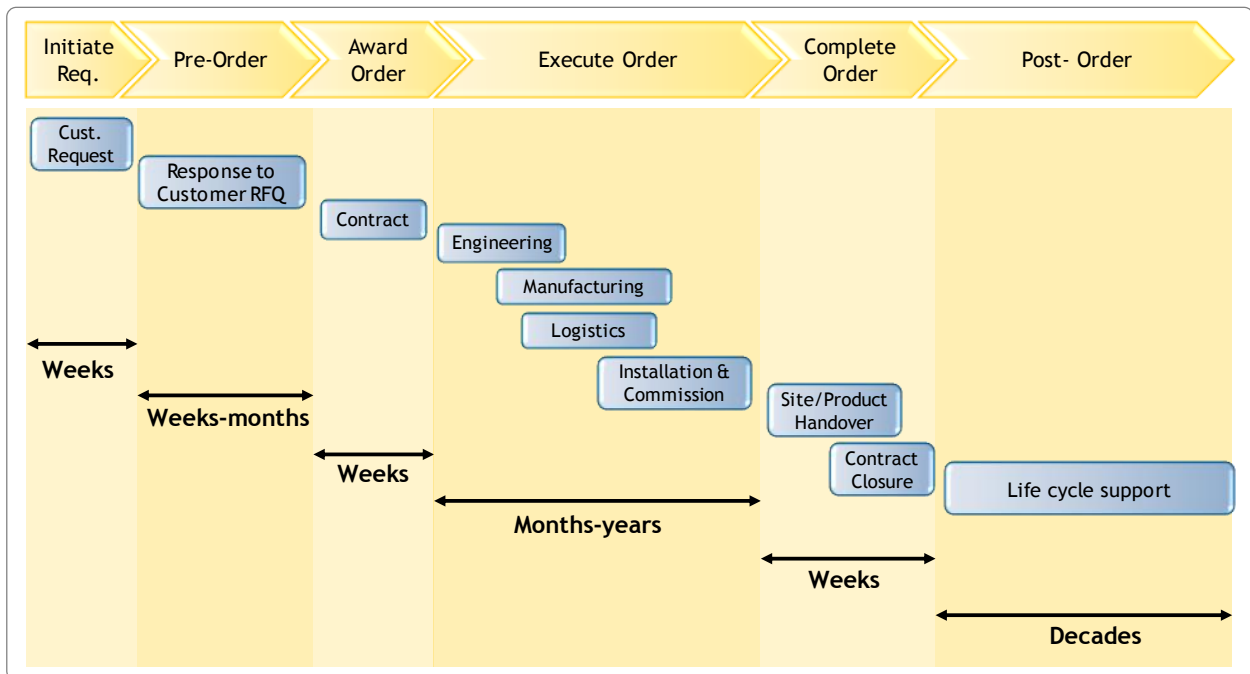
ETO complexity is proportional to the uniqueness of the enquiry and final product, involvement of the end customer and engineering team from the stage of enquiry and specification complexity. It is inversely proportional to the part reuse, volumes and repeatability of the order.



1: Enquiry Management Challenges

With fierce competition defining today's global market, the customer demands top quality products at lower prices, delivered at the shortest possible lead time. This reality has driven the project-based manufacturing industry to a seamless and collaborative approach based on enquiry through commissioning. For this approach, it is essential to have a rugged, integrated

and efficient system for managing information through each stage of order fulfillment. These classical stages are categorized as pre-order stage, order processing/execution stage and post-order stages, portrayed in the diagram below:



2: Typical ETO value chain

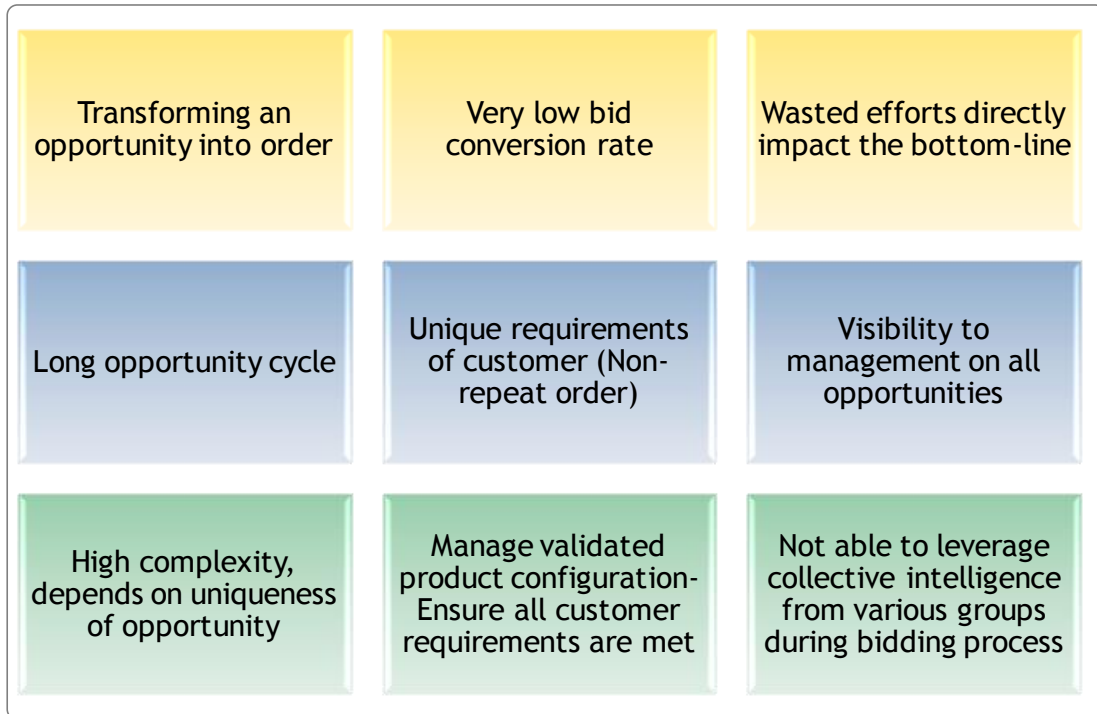
The pre-order (initial request to award order) phase is the foundation of the project-based manufacturing industry as this phase has significant impact on companies' top and bottom lines. Indeed, the bid-win ratio is one of the most critical parameters influencing business growth, and proficiency in this regard is imperative.

The major challenge in this industry is a low bid-win ratio that is generally 20% to 25% for the most efficiently managed organizations. It is essential that the proposal engineering team spends most of its efforts on winning proposals. To achieve these objectives, it is necessary to apply a systematic approach to the enquiry management process - one that entails qualification, judicious selection, and prioritization of enquiries.

While there are several commercial off-the-shelf (COTS) products addressing this issue, these do not address the entire enquiry management process, i.e., involvement of diagnostics, enquiry prioritization and fact-based proposal engineering.

Enquiry Management Challenges

Some of the common challenges that the ETO industry faces in the pre-order phase are represented in the diagram below.



3: Enquiry management challenges

The facts do not lie - the ETO industry has a low bid-win ratio despite high and costly engineering hours spent in the creation of proposals. Much of these undertaking efforts are wasted by improper bid selection and prioritization of enquiries.

The proposal estimation stage has historically held low confidence, due to an absence of central repository of the previous bids, engineering information and heterogeneous IT systems. The manual or ad-hoc process of managing enquiries has longer lead time and is by definition inefficient. In a similar manner, the involvement of detail engineering and manufacturing projects is limited at the pre-order stage as a result of the inadequate skill set of personnel involved at this stage. At the same time, management has limited visibility to track and audit enquiries from commencement through submission.

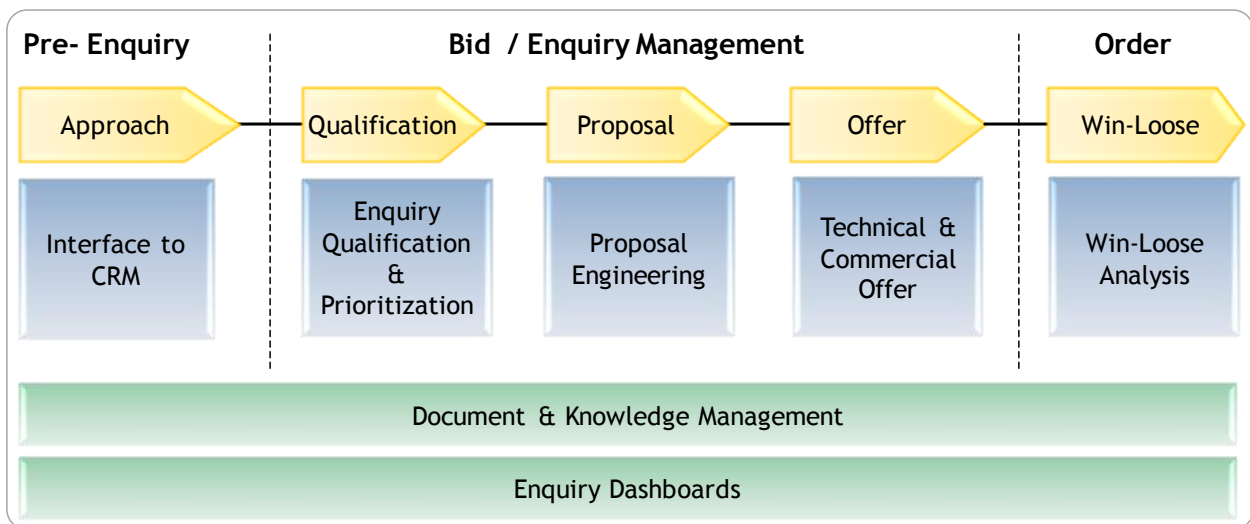
In the pre-order phase, the Marketing department and the Engineering department must work in collaboration in order to create a winning proposal. To achieve this, the Engineering Department requires information concerning specification, design and reference to Bill of Materials (BoMs) whereas the Marketing Department needs BoM inputs for costing and reference to previous similar proposals.

It is imperative to use the PLM platform for enquiry management as existing engineering documents and knowledge can be leveraged effectively. Concurrently, the information at the pre-order stage can be easily and efficiently shared with the execution team.

Challenges addressed by using PLM-based solution

PLM solutions are designed for enterprise-wide applications and are supported by a robust database for storage of information, a powerful workflow engine for collaboration, seamless integration capabilities with other applications and excellent key performance indicator (KPI) dashboards that allow for enhanced management capability.

The bid-win ratio or enquiry conversion, which is the most critical for project-based manufacturing industry, is also one of the key metrics of the 'Enquiry-bid-order' process.



4: Enquiry Management Solution Blocks

The PLM-based solution represented in the diagram above, has the capability to analyze enquiries using a 'Business Rule Engine' (BRE) based on the organization's pre-defined parameters as well as select the enquiries for bidding. PLM as a tool provides document management as a common backbone. This is also a solution for knowledge management, which enables access to previous similar proposals, reference BoM and other relevant information.

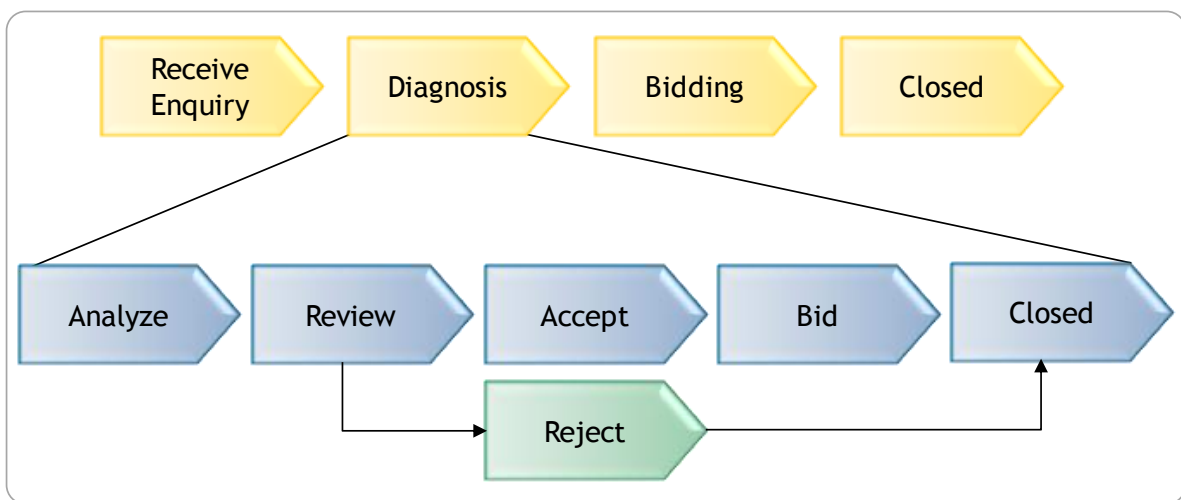
An analytical capability built on top of the PLM solution delivers the KPI dashboards for management. A knowledge management capability, also built on top of PLM, enables R&D for focused innovations and proposal engineering and marketing, using previous win-lose analysis for better qualification enquiries.

This brings us back to the notion of 're-use' or 'commonization' - why re-create that which has already been undertaken?

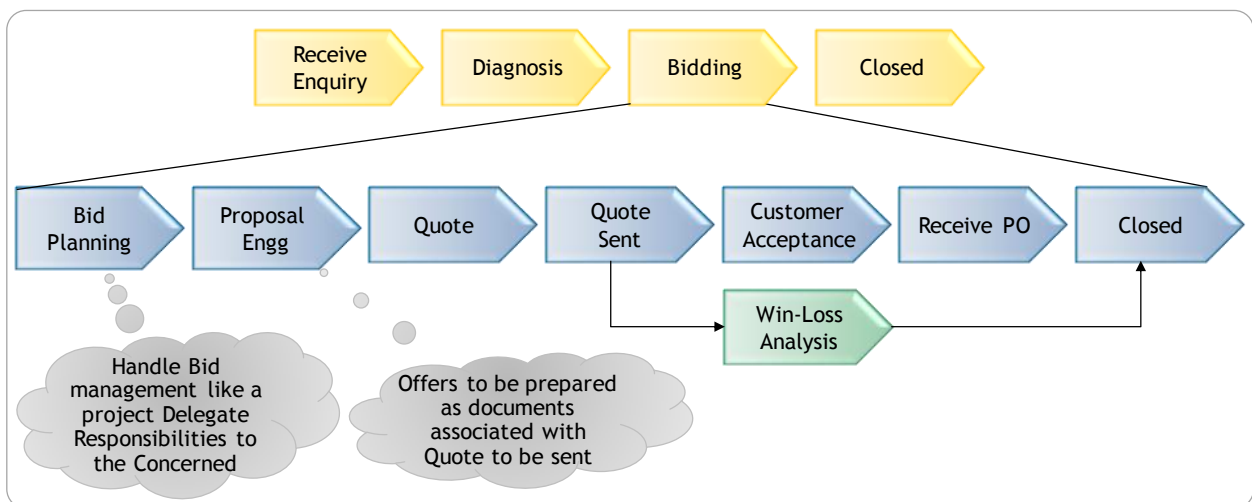
The typical lifecycle of the pre-order stage along with the responsibilities at each stage of the said solution is represented in the diagram below:



Enquiry umbrella process



Enquiry Diagnosis process

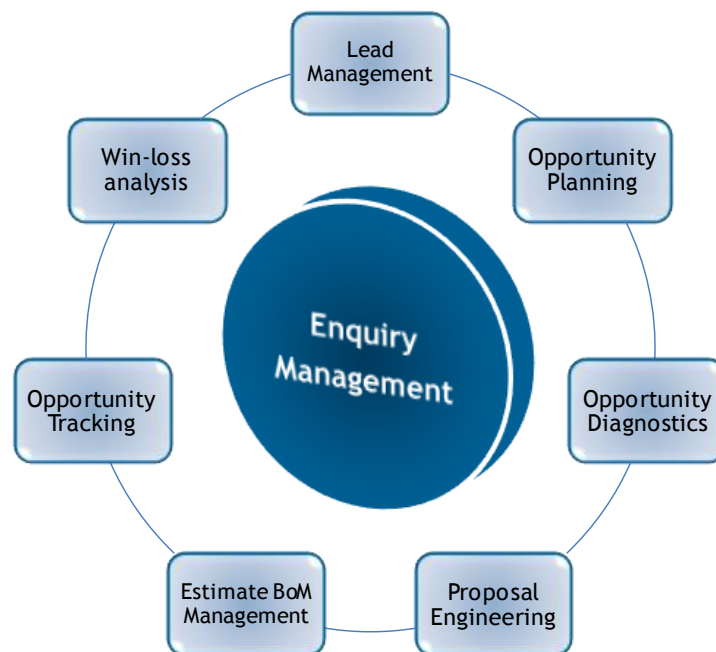


Bid/Enquiry Management process

5: Typical Enquiry Management Scenario/Workflow

Benefits of PLM-based solution

The best-of-breed PLM platforms offer enhanced functionalities that include strong workflow management, project planning, document management, knowledge management and built-in analytics to deliver following features:



6: PLM enabled enquiry management features

PLM-based solution offers the following benefits:

Lead Management: Helps in creation and tracking of leads, and can be converted into an 'opportunity' as and when required.

Opportunity Planning: Opportunity is treated as a project and Opportunity Response Plan is automated and standardized for organization.

Opportunity Diagnostics: Opportunity is diagnosed based on “Ability To Execute”, “Ability to Win” and “Attractiveness of Opportunity” by different departments.

Proposal Engineering: Commercial and technical proposal based on stake holders (Engineering/ Sourcing/ Costing/ Legal) input integration.

Estimate BoM Management: Estimate of BoM can be created and managed for opportunity along with different Product Configurations

Opportunity Tracking: Provides facility to “Marketing”, “Sales”, “Engineering” departments and management for tracking the opportunity from creation, through qualification till its closure

Win-loss analysis: Capture analysis of win-loss and generate analysis report.

Conclusion

The enquiry management process demands planning, collaboration, knowledge management and reuse and strong analytics requirements to efficiently manage the same.

An appropriately built IT system will include the following features/functionalities to effectively manage the entire enquiry/bid process:

- **Planning:** Ability to plan enquiries/bids right from its inception to project award through multiple tasks being managed by multiple stakeholders
- **Collaboration:** Ability to set up a collaborative environment within various marketing, proposal engineering and projects teams to qualify right opportunities and build-up techno-commercial proposals
- **Knowledge management & reuse:** Ability to reuse product configurations, enquiry planning templates, commercial & legal terms & conditions and lessons learned
- **Analytics:** Ability to conduct what-if analysis on top line and bottom line imperatives
- **Tracking & visibility:** Ability to build visibility across whole enquiry lifecycle

Modern PLM solutions bring these functionalities out of the box and help reduce enquiry cycle time, improve confidence in submitted proposals, integrate backward supply chain, and improve traceability and visibility of enquiry process to the management.

PLM also offers a platform for knowledge management, process standardization and enhances collaboration between cross-functional teams and extended organizations, greatly expanding the population of decision makers involved in the ETO processes. An expanded decision making population, supported by consistently delivered rich product information, will drive improved results for ETO product companies and untold benefits to their clients.

Abbreviations and Acronyms

ATO	Assemble to order
ETO	Engineer to order
CTO	Configure to order
MTO	Make to order
BoM	Bill of Material
BRE	Business rule engine
COTS	Commercial off the shelf

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About the Author



Sachin Kulkarni leads the Manufacturing Industry Solutions Group at Larsen & Toubro Infotech Ltd. He has over 15 years of industry and consulting experience in New Product Development and Supply Chain Management domains. He has worked in India, North America, Europe and South East Asia in Automotive and Industrial product companies. Sachin holds a BE degree in Mechanical Engineering (specialization in IE) with an MBA in Marketing. In addition to this, he is a Certified Supply Chain Professional (CSCP) from American Production & Inventory Control (APICS) and a Qualified Project Management Professional (QPMP)

About L&T Infotech

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