Increasing Bid Success Through Integrated Knowledge Management

CIMdata Commentary

Key takeaways:

- *Program success begins in the proposal phase when the focus is on both minimizing risk and defining the right product in order to acquire new business.*
- *Companies must have the ability to respond rapidly to Requests for Proposal (RFPs) with confidence in their proposals.*
- *Delivering on commitments and defining the right concept to win profitable business requires integrating systems engineering with proposal development to support reuse of prior trade studies and early planning for production and maintenance.*

Introduction

In today's competitive global markets, aerospace and defense (A&D) companies need to do more with less. Because of budgetary constraints, programs are smaller than before, and companies are now seeking new business across the globe. As a result the volume of proposals is on the rise. Companies must respond more efficiently than before to requests for proposal (RFPs). Companies must compete with innovative design and production concepts that effectively address their prospect's needs at a competitive price while maintaining acceptable margins. This process is even riskier now, given the recent shift in A&D from competition based on the aircraft or weapon system's performance, to competition based on the full lifecycle cost including acquisition and sustainment. This creates more pressure and risk for bidders to get the bid and proposal right the first time. In some cases, the program bid must address operational performance and ongoing system upgrades, as well as the service and maintenance that will last throughout the entire life of the program.

Whether responding to a government defense request or designing a new product for the commercial market, speed with accuracy for the full lifecycle is necessary to win programs and ensure their profitability. The pressure to respond quickly can limit the time and effort the bidding company can expend on critical design decisions—decisions that impact product performance and total lifecycle program cost. Studies have shown that the decisions made during the concept phase of product development can determine up to 80% of the program lifecycle cost. Getting it right during the concept and proposal phases makes the difference between delivering profitable products that are well received in the market, submitting a losing bid, or winning the bid but losing money on the execution of the program.

Long-term program success in A&D requires getting the early phases of the program right. Once the conceptual designs are created, a majority of the program cost is established. However many A&D companies struggle to excel as their programs increase in complexity. Slips and cost overruns on programs such as the Joint Strike Fighter and the Boeing 787, and the Airbus A380 schedule, are examples of this challenge. This "get it right up front" problem is not just an A&D issue. Companies in all industries struggle with it. New approaches and solutions are needed to help companies make better decisions during the early phases of a new product program.

Winning and Securing Profitable A&D Business

Competing more effectively and profitably means that companies need a systematic approach to define, bid on, and deliver increasingly complex A&D systems. Such an approach includes the ability to:

- Select the right concept alternative that balances risk and capability
- Correctly validate the opportunities and risks by performing the right trade studies
- Efficiently manage the proposal and program execution, including the ability to efficiently respond to change
- Support product and process reuse by systematic knowledge capture and cataloguing
- Connect the extended organization (e.g., engineering, requirements management, contracts management, program planning and controls, systems engineering, configuration management, supplier management) with a common language and view

Selecting the Right Concept Alternative

Companies need to follow a systematic approach to define and deliver the increasingly complex A&D systems being required by both government and commercial buyers. For any given set of requirements there are literally thousands of ways to satisfy them. The challenge is to make the right choices that balance risk and opportunity throughout the lifecycle. The creation and use of a framework to collect, organize, correlate, and store system architectural data is an important step to meeting this challenge. This formal framework gives the extended enterprise team the ability to connect their individual multidiscipline efforts, and it provides a central point from which to drive decision-making against key program performance indicators.

Validation by Performing the Right Trade Studies

Executing systematic trade studies is a proven method for reducing the number of possible solutions to a design problem. These studies are conducted by experts in different disciplines who must collaborate to complete the necessary analyses. Several factors can limit success. There are many cases where time and resource constraints result in less than complete trades, where the best alternative is not found before the proposal is submitted. These studies require collaboration across different disciplines, which often use different simulation and analysis (S&A) tools and data management solutions. This can make it more difficult to share and reuse data. Leading companies are seeing early success using a common data management approach for simulation and optimization tools across the product lifecycle simulation, to enable data reuse and enhance analytic efficiency. Additionally, using simulation to perform enhanced trade studies can extend the trade study process from a specialist operation to an enterprise product development enabler that spans many disciplines supporting the product lifecycle.

Collaboration between the concept phase and the development phase, where they readily share enhanced and expanded trade studies, helps improve fidelity, accuracy, and traceability.

Efficient Proposal and Program Management

During proposal development, companies need to effectively communicate, collaborate, and coordinate the activities of a dispersed proposal team. Data and process management platforms with strong project management functionality offer an environment to support this requirement. In CIMdata's world-class PLM model, these are termed collaborative Product Definition management (cPDm) solutions. They often include governance and collaboration tools that help document and manage program and project-related information. Using these solutions, companies can govern the interaction of diverse, geographically dispersed teams more effectively. This can help to improve program definition and delivery, and to achieve a better balance between capability and cost, which is essential for winning new business and meeting customer requirements. Companies that connect their program management functions with the system engineering and trade study processes are seeking to enhance collaboration and improve efficiency.

Systematic Knowledge Capture in Support of Reuse

By increasing the reuse of existing program knowledge and the reuse of trade studies, companies can reduce proposal response time while increasing fidelity. Requirements management and traceability are essential to success in A&D programs. In the concept development phase, companies must be able to define and manage requirements in a closed-loop manner to create an optimal conceptual design that is compliant with all requirements. They need to verify that all program deliverables are validated to ensure they satisfy the requirements as specified. They must define the complete system architecture and compare the impact of different design decisions against that conceptual architecture. Providing full traceability from requirements, to system concepts, to trade study models, and from scenarios and results to proposal deliverables, enhances a company's ability to respond to change. Ideally, these best practices are captured as enforceable process templates, ensuring that the right tasks are performed and the right deliverables captured at the right time.

Additionally, when a company's IP is captured, cataloged, and placed in easily accessible libraries, the opportunity for product reuse increases dramatically. Reuse of proven systems is critical to satisfy tight fiscal program constraints. It is not enough to have a product catalog. The goal should be to have a system catalog that combines the requirement fulfillment, the system logical architecture, the validating trade tools and results, production concepts, costing, and projections for related work breakdown structure (WBS) elements. Leveraging such a system catalog can reduce risk and increase confidence in the evolving system.

Connecting the Extended Organization

Today, the A&D community typically uses a mix of specialized tools and systems to manage their businesses. Project control analysts use stand-alone cost and schedule tools to plan program execution and then to measure performance. Contract data managers typically have custom solutions to identify and manage data requirements and delivery. Configuration managers are required to work with a variety of tools that include various PLM solutions, spreadsheets, and custom databases, as well as a set of home-grown tools. Systems engineers often use stand-alone commercial off-the-shelf (COTS) requirements management solutions. Contract managers are often forced to work in a heterogeneous environment, using ERP solutions for some tasks, and spreadsheets and custom databases for others. Subcontract administrators face almost identical issues. Complicating matters, very few of the existing tools work together. For the most part, each tool was developed by a separate

functional discipline to address a specific need, without considering the needs of the larger organization. If the organizations required no information, work product, or status from other organizations, this model would work. However, no organization operates in isolation. Each discipline must communicate and collaborate with other disciplines to ensure program success. Companies seeking a competitive advantage understand they can't maintain the status quo. Separate databases, processes, and tools that do not provide real-time information-sharing frequently lead to miscommunication, errors, and time delays. Meeting all contractual obligations in a reliable and efficient way takes a solution that integrates all critical program management information into one consistent whole.

Benefits

Since decisions made early in a program determine the cost and profits over the life of the program, better up-front analyses of design alternatives using system and production trade studies are essential. This approach often provides significantly more information, yielding greater insight into design options and helping to select a lower cost alternative.

Providing a single source of truth for bid process and concept development helps eliminate silos of information, redundant and error-prone data entry, and other inaccuracies. All program team members should have access to a single view of the conceptual design. Later in the development phase teams can leverage all the same data to shorten cycle times and manage conformance to requirements. Trade studies and analyses from the concept phase need to be managed in the same environment used in the development phase to support convergence to proposal deliverables.

Managers must be able to monitor program performance, including program schedule and program cost, with greater efficiency and insight. Tools are needed to capture design knowledge to help designers investigate more "what if" scenarios, and to retain valuable knowledge within the company. With more analysis, higher fidelity concepts can be identified with confidence, providing the opportunity to reduce overall program costs. Increasing the number of trade studies conducted during early program phases can result in a design that best meets the stated requirements. Meeting requirements without costly changes also helps lower overall program costs. Capturing the full analysis history (including models, scenarios, and results) provides information that can be used in future studies and proposals, significantly reducing the time to develop new proposals.

Conclusion

The A&D industry is highly competitive and requires companies to win business by rapidly developing proposals that meet complex sets of requirements. CIMdata believes that the best way to meet this challenge is using a robust cPDm platform that supports advanced functions like requirements management, program and project management, and alternative/trade studies. Improving a company's ability to conduct more trade and program studies earlier in the concept development and program definition phase can have a significant impact on their ability to win more profitable business. Companies need to be able to better manage and leverage their intellectual property (i.e., concepts, previous designs and work, etc.) and to share that information securely with all people (internal and external) working on a proposal. Having integrated environments that support full proposal development and program execution will differentiate leaders from followers in the A&D industry.

About CIMdata

CIMdata, an independent worldwide firm, provides strategic management consulting to maximize an enterprise's ability to design and deliver innovative products and services through the application of Product Lifecycle Management (PLM). CIMdata provides world-class knowledge, expertise, and best-practice methods on PLM. CIMdata also offers research, subscription services, publications, and education through international conferences. To learn more about CIMdata's services, visit our website at http://www.CIMdata.com or contact CIMdata at: 3909 Research Park Drive, Ann Arbor, MI 48108, USA. Tel: +1 734.668.9922. Fax: +1 734.668.1957; or at Oogststraat 20, 6004 CV Weert, The Netherlands. Tel: +31 (0) 495.533.666.