Quality & Reliability Engineering Consulting Practice
Designing for Reliability through Capture & Reuse of Failure Knowledge

Increasing connectivity and artificial intelligence in products and product-systems will impact both design complexity and software content, which will make it considerably more difficult to ensure product dependability, resulting very likely in more recalls and launch delays than we see today. The lack of understanding about potential failure modes of complex, software-intensive products amongst subject matter experts is creating this dependability challenge. As a result, crucial failure modes of smart, connected products could easily be missed during design, verification, and validation cycles and they could manifest themselves when the products are in the hands of end customers.

Systems engineering has traditionally been applied for realizing highly complex systems and it will continue to be employed for developing smart, connected products. Systems engineering begins with the discovery of the real problems that need to be solved and the identification of highest impact failures that can occur. Then, through an interdisciplinary approach to engineering, it attempts to find solutions to those problems and potential failures. To ensure the dependability of complex systems, an enterprise level integration between the solutions for systems engineering and the solutions for reliability engineering is desirable. In most current industrial applications such an integration is custom built and patchy. Enabling enterprise level design-for-reliability by resolving this disconnect is one of the areas our Quality & Reliability Engineering consulting practice and Knowledge Council addresses effectively.

Dependability issues within complex systems are likely rooted at the intersection of different engineering disciplines and at the interfaces between subsystems, where human engineering intuition tends to be low. Consequently, even if the systems engineering capabilities are seamlessly integrated with the reliability engineering solutions, the lack of engineering intuition of subject matter experts will likely result in dependability issues for smart, connected products.

CIMdata's Quality & Reliability Engineering (QRE) consulting practice focuses on enabling "learning system based design-for-reliability" in order to deal with the complexity and the speed of evolution of software-intensive products as well as the associated challenge of low insights into potential failure modes. This calls for systems engineering to be seamlessly integrated with reliability engineering and supported by a product failure knowledge capture and reuse system. The QRE consulting practice leverages CIMdata's established consulting services, insights, practical experience, best practices, focused research, maturity models, and roadmaps to provide guidance on how to develop dependable software-intensive products of the future.
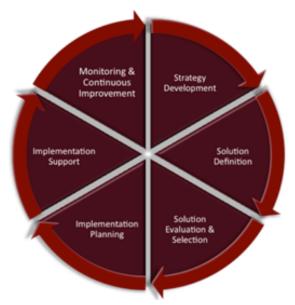
Quality & Reliability Engineering Knowledge Council

CIMdata's QRE Knowledge Council has been established to maximize the benefits participants receive from their investments in systems engineering and reliability engineering tools and methods. QRE Knowledge Council enrollment is open to OEMs and suppliers in diverse industry verticals, e.g., aerospace, automotive, heavy machinery, high tech, and medical devices, as well as, to software solution providers and systems integrators engaged in those verticals. The objective is to collectively close technology gaps, expose needed standards, and co-sponsor collaborative research with CIMdata for the purpose of mitigating product recall and nonconformance risks.

Participation in the Knowledge Council enables members to make more informed business decisions by providing timely and valuable information, insights, and advice while networking with companies with similar challenges. Additionally, annual participation in this council facilitates an ongoing working relationship with CIMdata that strengthens and enhances the value of support available to each member.

The CIMdata Approach

CIMdata's methodology recognizes that the successful planning, selection, and implementation of new business strategies and solutions involves ongoing, cyclical processes comprised of six phases. This applies to every organization—whatever the industry, whatever the particular requirements or applications, and whatever the desired end result. Each of the six phases (as illustrated below) is separate and unique. Each is equally important, and for the outcome to be successful, each requires a set of targeted activities. CIMdata tailors its services to the specific business and operational needs of its clients, and is ready to provide support during each of the six phases.

Companies that deal with complex software-intensive products are attempting to deploy systems engineering technical processes that take advantage of the elements of PLM. However, the integration of systems engineering processes with reliability engineering tools is currently not appropriately planned and realized. For this, CIMdata's consulting services, which concentrate on how to best leverage the full range of PLM-enabling solutions by integrating the solutions into people's daily work processes, is very well suited.

Given the diverse tools used for reliability engineering and systems engineering, the question of interoperability between them is very significant. Our QRE Knowledge Council and consulting practice are focused on tapping the huge potential that remains in appropriately linking the reliability engineering tools with the systems engineering technical processes, by helping resolve the interoperability issues by supporting standards development and facilitating other relevant activities.

Finally, the implementation of failure knowledge capture and reuse solutions in the realm of systems engineering and reliability engineering is highly scattered and very much in its infancy. CIMdata's QRE consulting practice and Knowledge Council will appropriately guide the efforts of solution providers and industrial businesses to reach acceptance of failure knowledge capture and reuse solutions in the industry as part of the overall systems engineering, PLM, and reliability engineering closed-loop system.

Strategy Development

Strategy defines the purpose for collaboration and is derived from the business objectives. It defines what is required for transparency, accountability, execution velocity, and effective value chain collaboration. Defining the purpose is a crucial step in accelerating adoption of new processes and associated enabling technologies in a way closely aligned with the desired cultural attributes.

It is also critical to recognize that strategy is not about deploying technologies, but rather about clarifying internal and external collaboration and robust decision-making processes and capabilities needed to achieve the business objectives as a critical first step.

Solution Definition

CIMdata's consulting methodology includes a number of tailored activities that support the development of a detailed solution definition. For example, CIMdata conducts a maturity assessment to understand the existing barriers to collaboration and the gaps based on leadership behaviors; organizational design; the processes and techniques for knowledge sharing, discovery, and acquisition; and the existing culture. The assessment provides insights into the current state from which to develop a roadmap to the future vision.

CIMdata's methodology supports the evaluation of solutions based on critical aspects of user adoption of new processes and associated enabling technologies. These include speed, seamless integration, ease of use, and alignment to existing workflows, to name a few.

CIMdata brings the most comprehensive view of PLM tools, processes, and techniques that can meet specific business objectives. CIMdata also assists our clients in aligning functional organizations such as sales, estimating, engineering, procurement, project management, operations, customer service, and information technology to a common solution that satisfies the business needs of each organization individually and collectively.

Solution Evaluation & Selection

CIMdata's extensive understanding of the commercially available solutions dramatically reduces the time needed to evaluate and select the most appropriate solutions. CIMdata's evaluation and selection methodology helps an organization focus on the business and technical issues that are most critical to achieve its strategy and vision. By leveraging CIMdata's knowledge of the available solutions and our clients' specific requirements, we are able to provide a short list of appropriate solutions for further evaluation utilizing a number of technical and business-oriented templates and methodologies.

Implementation Planning

Upon the selection of the appropriate enabling solutions, CIMdata's support continues through implementation planning. Over the years, CIMdata has provided a significant amount of strategic advice and counsel during this critical, but often overlooked phase of a project. CIMdata offers best practice support for statement of work development, contract negotiation, implementation team structuring, "to-be" process definition, systems definition, cultural and organizational change management, training, and more. CIMdata provides support tailored to our client's implementation planning needs.

Implementation Support

Any new strategic solution implementation requires both active implementation support and leadership engagement. CIMdata assists with creation of a team of change agents, representing different disciplines and lines of business that must be assembled to push adoption deep into the organization.

Implementation success requires executive sponsorship. CIMdata assists leadership with developing clear, simple, and straightforward guidelines. The emphasis is on innovation and business improvement as the primary drivers, but with the recognition that personalization is necessary to foster trust, as well as willingness to share and connect.

CIMdata assists with defining and establishing a group of communities representing various interests and functions within the organization, and leveraging them effectively towards the organizational goals. It is crucial that people enjoy the experience and work to gain quick wins. As these quick wins diffuse throughout the organization the implementation will gain momentum.

Monitoring & Continuous Improvement

Early on, the primary means of measuring adoption is to identify and celebrate successes and "smart" failures that lead to organizational learning. At this stage, it is also important to recognize the power of collaborators and innovators, and their positive impact on solution adoption. CIMdata leverages a set of assessment techniques and other best practice experiences to identify areas requiring improvement and then recommends roadmaps to move forward.

The QRE Consulting Practice provides essential support in all areas of the methodology outlined above. To learn more, please contact CIMdata at +1 734.668.9922.

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) solutions. Since its founding over thirty years ago, CIMdata has delivered world-class knowledge, expertise, and best-practice methods on PLM solutions. These solutions incorporate both business processes and a wide-ranging set of PLM-enabling technologies.

CIMdata works with both industrial organizations and solution providers of technologies and services seeking competitive advantage in the global economy. CIMdata helps industrial organizations establish effective PLM strategies, assists in the identification of requirements and selection of PLM technologies, helps organizations optimize their operational structure and processes to implement solutions, and assists in the deployment of these solutions.

For PLM solution providers, CIMdata helps define business and market strategies, delivers worldwide market information and analyses, provides education and support for internal sales and marketing teams, as well as overall support at all stages of business and product programs to make them optimally effective in their markets.

In addition to consulting, CIMdata conducts research, provides PLM-focused subscription services, and produces several commercial publications. The company also provides industry education through PLM certificate programs, seminars, and conferences worldwide. CIMdata serves clients around the world from offices in North America, Europe, and Asia-Pacific.

To learn more about CIMdata's services, visit our website at 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.