

## ***A Ten Point Guide for Streamlining Product Development with Systems Engineering***

### **The Systems Engineering Imperative**

Tech-Clarity research shows that manufacturers have grown the amount of software in their products, the importance of product software, and the level of innovation driven by software over the last five years. Products that combine mechanical, electrical, and software are compelling, but add tremendous product development complexity leading to quality issues, poor productivity, and delayed time to market. Tech-Clarity offers the following ten tips to help companies overcome these challenges by streamlining product development using systems engineering best practices:

#### **Start with Requirements**

Decompose customer and market requirements into detailed specifications, driving functional and logical models for successful products from the top down. Link each lower-level requirement to the demands that drive it.

#### **Take Time for Conceptual Design**

Invest the time to develop multiple concepts, determining how the system will meet requirements. Take the time to innovate, iterate, collaborate, and mature ideas and concepts to meet product needs in the most compelling way.

#### **Optimize the Architecture**

Get the architecture right up front, identifying which requirements will be met mechanically or through controls. Optimize the architecture for product success factors including performance, cost, quality, and maintainability. Conduct trade studies to optimize the functional systems architecture that will be fulfilled later through detailed design.

#### **Reuse at all Levels of Design**

Reuse wherever possible, driving efficiency and higher quality. Reusing functional blocks saves time in verification and validation in addition to design, even if the implementation of the function is different for different products or platforms.

#### **Simulate the System**

Simulate systems performance early in the design cycle, validating how logical and functional models will address customer and market requirements. Simulate, emulate, and digitally prototype products and design elements, modeling early and often to get the system right, particularly for mission critical safety functions.

#### **Manage Change**

Make sure that change, and more importantly the impact of change, is managed across all levels of the design. Ensure that changes are synchronized and implemented completely. Include requirements and models, and manage change across the mechanical, electrical,

and software elements of the design, and account for all relationships. Focus on details such as approvals, validation, notifications, workflow, visibility, and collaboration to reduce risk.

### **True Transparency**

Ensure that status, issues, and work in progress are visible across disciplines, allowing teams to make better decisions. Allow collaboration between teams, across disciplines, and across the globe. Make relationships between data clear so the impact of issues or changes can be proactively addressed in related and downstream processes.

### **Track and Trace it All**

Track everything from requirements down through logical and functional models, deliverables, test procedures, and results. Provide traceability from top to bottom, bottom to top, and across, ensuring that the product meets market

needs and enabling effective change management. Meet regulatory requirements efficiently and improve audit results with accurate data instead of recreating relationships after the fact.

### **Validate and Verify with the V**

Leverage the “Systems V” concept for test strategies and test methods, ensuring that what is built is what was intended. Avoid testing only against what was designed, instead validate fully against requirements to ensure the product is fit for purpose.

### **Manage Configurations Continuously**

Know what physical parts and software your products have in the field, enabling better service and performance. Manage as-built and as-maintained data about products to support long product lifecycles and enable better decisions.

## **Key Takeaways**

Developing smarter products is the new business reality, but drives increased complexity in product development that if left unaddressed can erode quality, destroy efficiency, and slow time to market. Systems engineering best practices are emerging that help companies overcome these challenges and take full advantage of the opportunity to develop more innovative and compelling products. The time has come to leverage systems engineering techniques to streamline product development.

## **About Tech-Clarity**

Tech-Clarity is an independent research firm that specializes in analyzing the true business value of software technology and services.

## **Special Thanks to IBM**

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