

## **ARC CLIENT REPORT**

By ARC Advisory Group

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# **Design/Build/Automate: End-to-End PLM**

**Prepared for Siemens/UGS**

**By ARC Advisory Group**



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## Executive Overview

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Clearly, manufacturers across all industrial sectors are being driven by a new set of business imperatives. Agile response to volatile markets, drastic reduction of time to market, and high product variability are just some of the challenges facing manufacturing. Along with the need for constant product innovation, manufacturers continue to focus on reducing the cost and time for producing the product, one of the single most effect means of remaining competitive. Moreover, reducing the time for product launch while optimizing manufacturing processes, will become even more significant as product lifecycle become shorter, product models and variants multiply, market prices erode, and outsourcing increases.

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Moreover, reducing the time for product launch while optimizing manufacturing processes, will become even more significant as product lifecycle become shorter, product models and variants multiply, market prices erode, and outsourcing increases.

In order to meet the demands of a consumer-driven market where production systems must be flexible and adapt quickly to new product introduction, manufacturers will need to consider a more holistic approach in bringing their products to market. From product conception and development through the creation and implementation of manufacturing processes to the design and commissioning of production systems and the automation that runs them, manufacturers will benefit from an end-to-end set of solutions that address the entire scope of the product lifecycle.

Bringing this situation into sharp focus, Siemens recent acquisition of UGS merges the physical world of manufacturing and automation with the virtual world of Product Lifecycle Management (PLM). This acquisition enables Siemens to offer a true end-to-end solution to manufacturers that will now extend upstream to product development and manufacturing processes rather than ending at the automation and controls. The scope of such an end-to-end solution can now encompass the entire product lifecycle, from innovation and product development, through the design and validation of manufacturing processes across a collaborative environment, and finally extending to the automation of production systems on the factory floor.

One of the key components and initial technology touch points to bridge these two worlds is Digital Manufacturing, which essentially integrates product design directly with manufacturing processes allowing the manufacturer to virtually simulate and validate production systems. Adding

UGS/Tecnomatix virtual simulation capability to Siemens' established automation business makes the merging of the physical and virtual factory a reality and tangible solution for manufacturing, and is the starting point for a more comprehensive integration of both companies and their respective technologies and solution sets.

## **Integrating Product Design with the Manufacturing Processes and Beyond**

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Fully integrating the digital product design with the manufacturing processes represents a major step in the development of PLM technology. The merging of the product design and manufacturing domains has culminated in the emergence of Digital Manufacturing. This concept begins with the design of the manufacturing processes through modeling methods and virtual simulation, and then manages manufacturing process information through the build phase of the product lifecycle. Additionally, these applications and solution sets enable effective collaboration between design and manufacturing engineering by sharing access to common digital product definition. As a major functional domain of PLM, Digital Manufacturing represents an integrated suite of solutions that supports manufacturing process design, tool design, and visualization through powerful virtual simulation tools that allow the manufacturing engineer to create, validate, and optimize the manufacturing processes.

### **Siemens/UGS Create the Digital Factory**

Today, this concept is being implemented by the use of integrated tool suites from UGS/Tecnomatix that are capable of generating powerful simulation, visualization, and other applications that can generate a virtual world of production lines, work cells, machines, tooling, and other equipment. Once the virtual production lines are created, the digital product design can be placed in this virtual environment in order to integrate the product design with the build process. This offers the manufacturer the ability to simulate entire the production process, along with the validation of these processes before the assembly lines are built, the machines and equipment are purchased and deployed, and resources are allocated.

With Digital Manufacturing technology now established as an integral component of an end-to-end PLM solution set, this provides the critical link between product design and manufacturing engineering, and enables the

collaborative environment that is so essential to successful execution of concurrent engineering practices. Clearly, UGS/Tecnomatix Digital Manufacturing solutions represent a key component of an overall end-to-end PLM strategy across the product lifecycle. Combining this capability with the comprehensive automation portfolio of Siemens A&D now offers the manufacturer the significant benefit of an integrated end-to-end product build process.

In essence, merging the UGS PLM solution set with the Siemens automation environment facilitates a holistic view of product, process, and automation as integral components of the overall product life cycle. This will enable product design methods to be sensitive to process constraints

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and capabilities, while being completely integrated with the manufacturing processes.

In the virtual 3D world created by the PLM domains of product design, digital mockup, and manufacturing process simulation, the final link to the actual production work environment is making the connection to production control systems. This merging of PLM with automation is exactly where tools such as UGS/Tecnomatix Robotics and Automation Solution are taking manufacturing in this link to the factory floor. Additionally, this represents the production environment where Siemens A&D, as an established industry leader in automation, provides the final piece in this end-to-end design/build/automate process.

## What Manufacturing Processes & Automation Bring to Product Design

It is not difficult for production operations and manufacturing engineers to understand the significant benefit of being able to virtually simulate and validate production systems and equipment prior to installation and commissioning. Conversely, a product design engineer may legitimately ask: how will knowledge of automation, controls, and production methods help me to design a product that meets the requirements for fit, form, and function? The simple answer is that being able to design for automation can result in a product that not only can be produced more efficiently, with high production yields, and better quality, but also results in a product with minimal design changes that gets to market faster and cheaper.

### **Designing for Automation**

A factory is a collection of process, each of which costs money to develop and maintain. One of the first strategic questions to consider in the automation of a production line is how to design a product that requires the minimal number of processes for fabrication and assembly. Additionally, once the manufacturing processes are designed and implemented, new products should be designed to run on these existing processes. Automation requires manufacturing and controls engineers who have an understanding of the operation and maintenance of the production systems and equipment. For today's agile and flexible production systems there is also a need for design engineers to understand the capabilities of the equipment and to design products for these capabilities.

With an end-to-end set of design/build/automate solutions that include production automation the manufacturer will be able to design, implement, control, and synchronize all processes from product concept through production systems.

### **Freeing the Design Engineer to Design & Innovate**

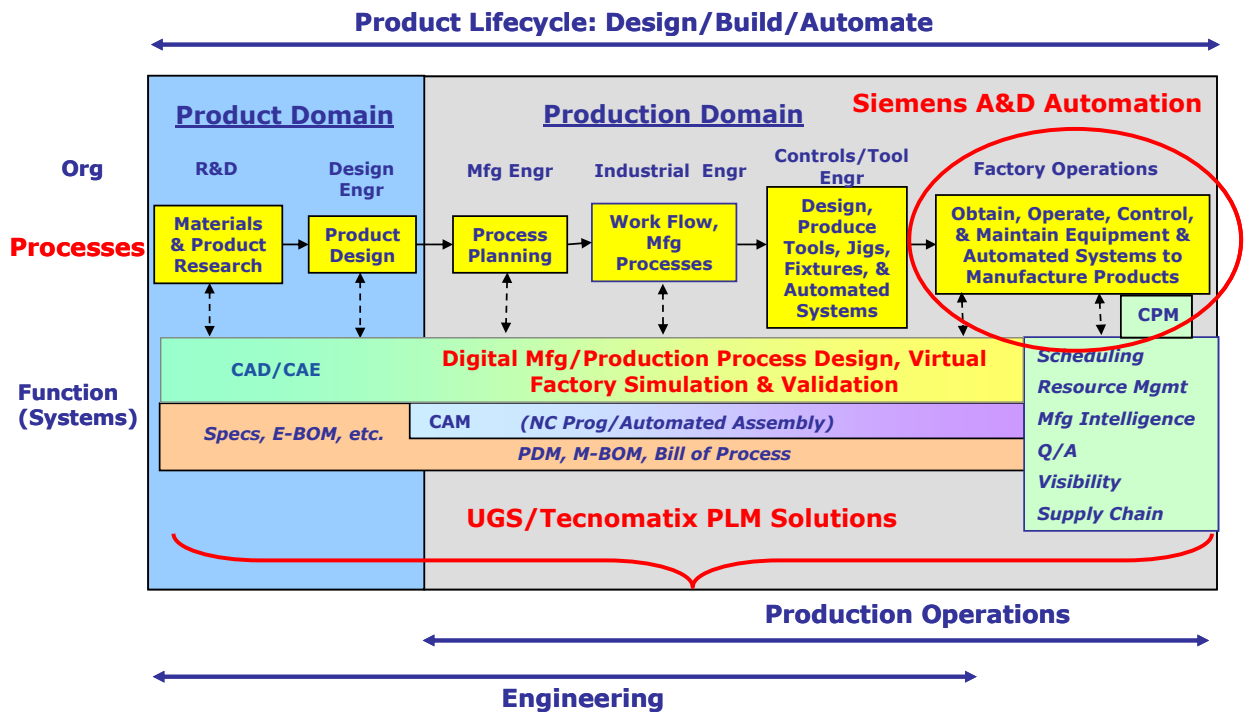
Connecting the product design world with factory production systems can allow for a significantly enhanced and more efficient process of validating the as-built product to the as-designed product. Moreover, essential design/build processes such as engineering change notices that are generated from manufacturing changes and optimization can be streamlined and incorporated faster and more accurately within a collaborative environment that includes production systems and automation. This can allow for design changes generated by manufacturing issues to be resolved much faster, enabling the product design engineer to spend more time on ideation and innovation.

## **Siemens A&D/UGS Synergies Extend and Unify the Product Lifecycle**

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On initial examination, there appears to a minimum of overlap between the two company's products and solution sets, while there are clear touch points in many areas. A clear message and strategy is emerging around the end-to-end design/build/automate capabilities that can now be offered to the manufacturing community.

Presently, Siemens A&D's primary customer base and the focus of their automation products and services are factory/plant operations, where they provide automation, controls, infrastructure, and equipment, and industrial IT. The UGS customer base essentially represents Engineering and IT organizations across multiple functional disciplines including product design, and testing (CAD/CAE), manufacturing processes (CAM, DM), product data management (PDM), and collaborative knowledge management. The combined product and services portfolio of Siemens A&D and UGS now represents a very comprehensive and formable range of solutions, applications, platforms, and production automation that possesses the capability to address every aspect of the product lifecycle.



The combined Siemens A&D and UGS solution set offered, from concept to consumer will have to make sense to a wide range of functional and organizational domains and people across the manufacturing enterprise. When we look at the product lifecycle from concept to product delivery it is relatively easy to determine where the UGS PLM solution set resides and where Siemens A& D automation resides. The message that will be conveyed and the ultimate business benefit to the manufacturing community is straightforward: between Siemens A& D and UGS all the bases will be covered across this product lifecycle.