Smart, Connected Products—Changing How We Design

CIMdata Commentary

Key takeaways:

- *Product complexity is increasing as products become smarter and more connected*
- *As new methods and paradigms for design emerge the importance of PLM to manage the increased scope of requirements and information needed for design, development, manufacturing, and service continues to increase*

Introduction

In their latest article on how technology and the Internet of Things (IoT) are changing products and business models, PTC President and CEO Jim Heppelmann and Dr. Michael Porter, Bishop William Lawrence University Professor at Harvard Business School discussed *How Smart, Connected Products are Transforming Companies*.[1] CIMdata is following this series of articles because we also believe that development of smart, connected products is changing how manufacturers need to think about and execute product design, development, and support as well as the essential nature of the products and solutions they develop and deliver to their customers, and the overall business model that they will follow.

Designing Products for the Future

One of the major impacts on manufacturing companies is how they must approach designing new products—they must think beyond the base functionality of the product and consider how that product will fit within and interact with ecosystems of other products, each of which is communicating with one another and with other business systems. One example is home products. Once standalone devices, thermostats now interconnect via the internet and doors, lights, and security can be managed remotely. This significantly increases product design complexity as software, electronics, communications mechanisms, security, and protocols must be embedded within the product. Companies are no longer developing 'products', they are developing components that will be part of a 'system of systems' in which each individual product is a mini system unto itself but is also part of a larger, interconnected ecosystem. Designing-in system interoperability is a key factor.

As Mr. Porter and Mr. Heppelmann point out "Smart, connected products require a fundamental rethinking of design." What is being designed is dramatically expanding in complexity, scope of use, and fit with other devices and systems. Product designers must consider how these new connected products will be operated and supported. Design factors that need to be addressed include:

- The base product's functions and capabilities
- How it will be operated, used, and serviced
- What information it must communicate and to what products or business systems

[1] https://hbr.org/2015/10/how-smart-connected-products-are-transforming-companies

- If the product or device will need to receive information from other products and sources
- If so, what information will be received and how will it be used
- How and how frequently information will be transmitted and/or received
- What level of information security must be enforced

In the article Mr. Heppelmann and Mr. Porter state “At the most basic level, product development shifts from largely mechanical engineering to true interdisciplinary systems engineering.” CIMdata agrees and believes that companies need to follow a systems engineering approach to product design and development to ensure that all functional, interface, and interaction requirements are identified and met. This will require new tools and educating more product developers about systems engineering and how to apply it.

This shift to smart connected products also impacts the product lifecycle management (PLM) environments manufacturers need to employ to efficiently develop and support new products and solutions. They need PLM environments in which requirements and information related to discrete mechanical components, electrical components, electronics, software, other physics domains (optics, chemistry, etc.), manufacturing, and service can be linked and managed effectively and consistently.

The Importance of PLM in a World of Smart, Connected Products

The original purpose of PLM was to efficiently manage related product information and better enable collaboration in a world of distributed and wide spread workers and information. In today’s IoT era of smart, connected products, PLM has never been more important. Designing smart, connected products that will work within the new ‘system of systems’ requires that personnel in almost every enterprise domain have access to the information they need, when they need it, and can seamlessly provide feedback to the other domains that may be affected by their design decisions. Importantly, new capabilities are also needed that enable the ability to design the communications, interactions, and status reporting required to create the smart, connected devices that will deliver the functionality and value customers are expecting. By delivering clear, concise, and valid information, regardless of domain, when and as needed, PLM helps manufacturers ensure that their new products can be designed to properly interconnect and interact with one another and provide the data needed to keep these dynamic systems working at peak efficiency.

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.