

Can Your Enterprise Architecture Support Digital Transformation?

CIMdata Commentary

Key takeaways:

- *Non-linear growth in product complexity and global competition are driving the need for digital transformation.*
- *Surviving and thriving in today's world require a modern enterprise architecture that creates a digital thread that properly manages digital twin configurations across the full lifecycle so effective decisions can be made.*
- *Compromises in legacy or monolithic architectures inhibit fast, accurate impact and traceability analysis, two critical decision processes in today's fast paced innovation-driven business world.*
- *The Aras PLM Platform provides a strong foundation for digital transformation initiatives and is currently deployed at leading industrial companies such as General Motors, Airbus, and Microsoft.*

Customers, suppliers, competitors, regulators, and the drive to globalization are applying ever increasing pressure for better products at lower prices. At CIMdata we hear about this increasing pressure from our industrial clients daily, and also hear how solution providers are helping industrial companies transform their businesses to counter the pressures, survive, and even thrive. Faster implementation of product and business process innovations are well understood as a solution to these issues.

Successful product and business process innovations are the result of making good decisions. Decisions range along a continuum from making simple choices to long-term, high impact, strategic choices. We all make decisions every day without data and information. This is fine for clear-cut or low impact decisions, but as the consequences of decisions get more complex, the risk of adverse impact from poor decisions grows. It's harder for the human mind let alone an organization of any size to understand all the relationships between inputs and outputs, which leads to sub-optimal decisions and errors. When errors happen, then you have to react and make another decision, without necessarily understanding what caused the initial error. This trial and error approach is expensive and time consuming. When decisions are scaled up and cross functions, disciplines, and organizational boundaries, it's a wonder anything works in this world.

Fortunately, advances in technology have enabled much of the information that describes the world as we know it to be converted to digital data, organized, and structured. This conversion underlies today's hot topic, "Digital Transformation," which is commonly defined as "the process by which a company evolves its organization, processes, supporting systems, and business model from analog to digital." Digital transformation, a CIMdata focus since its inception, is orders of magnitude more complex than converting paper documents to electronic files, and manual processes to electronic workflows. When used appropriately, digital information helps decision makers gain the insights they need to be confident that they are making correct, effective decisions.

Digital Twin and Digital Thread the Keys to Digital Transformation

CIMdata defines the digital twin as "a physics-based description of the system resulting from the generation, management, and application of data, models, and information from

authoritative sources across the system's lifecycle." The most important digital asset a company owns is its product definition. A fully formed digital twin is a configuration of all the data needed to produce and support a product throughout its life. When products are purchased by customers, they are paying for the real, physical twin of the product, however IoT is enabling new features and services that add incremental value to product users and product providers via the digital twin.

The digital thread refers to the communication framework that allows a connected data flow and integrated view of an asset's data (i.e., its Digital Twin) throughout its lifecycle across traditionally siloed functional perspectives. Leverage of the digital thread enables a digital twin configuration to be driven or exercised with simulation inputs to verify the configuration will perform as planned before it is produced. The digital thread also is driven by field data to virtually replicate issues helping to identify problems after production. These two scenarios are the basis of two critical processes within product producing enterprises: impact analysis and traceability.

Few, if any companies have fully implemented a digital twin strategy for their products, because it is a difficult problem. While the digital transformation term is new, it has been happening for decades, and is now hitting critical mass in which huge positive business impacts are very close or even starting to be realized. Technology evolution and improvement, standards, market pressures, and general knowledge are now at a point where the decades old vision of digital product definition, including digital twins, is within reach.

The Burden of Legacy Technology

To effectively support a decision making process, data must be organized and managed, so it is clear, concise, valid, and usable, a task much easier said than done. Historically, data about the product has been stored in many silos across multiple functional areas, including downstream areas not managed by product development. Information from areas such as manufacturing, supply chain, and service are especially critical to define and support as-manufactured and as-maintained configurations of the digital twin. The Internet of Things (IoT) and Industry 4.0 initiatives are new sources of data that risk becoming instant legacy systems unless the data generated is properly organized, integrated, and managed.

Most of today's large enterprise software solutions have been around for several decades and are commonly organized into functional silos. Typically, they started out focusing on a single function and added capabilities to grow into adjacent functional areas. Enterprise Resource Planning (ERP) started out ordering and managing material for the factory floor and grew into managing the manufacturing BOM, as well as the finance function including sales and receivables (i.e., the Order-to-Cash process). The majority of today's PLM solutions started out as product data management (PDM) for documents and CAD files. Over time, these solutions grew into managing configurations of product data from requirements through product and process design and engineering.

Enterprise software suites such as ERP and PLM are commonly created by acquiring products and technology. The merger and acquisition strategy potentially allows the company to address a new market opportunity more quickly. However it does have downside issues. The result is often stitched together solutions each with its own architecture, which causes limitations in what the solution can be configured to do. Customers often don't understand these limitations until after they start their implementation.

Reengineering efforts to consolidate onto a single software architecture are difficult as customers don't want to migrate off what is working, until all the capabilities exist in the

reengineered product. Reengineering also requires significant investment and slows new capability development often to the dissatisfaction of existing customers. Furthermore, once the acquisition is complete, the acquiring company does not have as strong an incentive to consolidate the products as the revenue and customers have been captured.

Legacy architectures not designed to support end-to-end business processes struggle to support today's business requirements such as traceability and impact analysis. These business processes are required to span across silo boundaries and the product lifecycle forcing customization and other workarounds. The solution to these problems is to implement a new enterprise architecture, a product innovation platform.

Modern Architecture Requirements

Information Technology (IT) has evolved in many ways to be a utility service. Historically, IT was focused on technologies such as hardware, operating systems, networking, and lower level infrastructure. As those areas have matured, IT has been able to focus more on solving business issues. The underlying infrastructure can't be ignored, but it is no longer all consuming. By leveraging a platform strategy, IT is able to focus on solving business issues. Ultimately, ensuring that data and processes are able to support current and future business requirements.

Solutions are available today that can support the ultimate vision of an end-to-end view of the business, as well as the product lifecycle including the critical processes of traceability and impact analysis. There are two primary strategies for legacy solution providers: continuous improvement and discontinuous innovation. Each has benefits and drawbacks. Continuous improvement is usually less disruptive to customers but adding breakthrough functionality is more difficult because legacy data and capabilities must be supported. Discontinuous innovation will usually provide advanced capabilities faster, usually at the expense of useful legacy functionality. Furthermore, discontinuous innovation usually requires users to deal with a new implementation rather than an upgrade.

Replacing a PLM solution is usually a large complex project that few companies take on without significant deliberation. A key aspect of any major change is ensuring it will last, i.e., it is future proof. For a PLM solution to be future proof it needs to support on premise, cloud, and hybrid infrastructures, as well as current and emerging applicable standards. Since no single solution will likely be able to support all these requirements, a wide range of connectivity options must be available from custom direct integrations for legacy solutions to modern Service Oriented Architecture (SOA) connections like Simple Object Access Protocol (SOAP) and Representational State Transfer (REST). And last, but far from least, security must be inherent throughout the solution, and flexible enough adapt as security technology and processes evolve.

Aras PLM Platform

In 2018, CIMdata added Aras to our Mindshare Leaders list. While smaller than their competitors, Aras has seen considerable success over the last few years as shown by well-known companies such as General Motors, Airbus, and Microsoft who have implemented the Aras PLM Platform. The Aras PLM platform is still architecturally clean, that is they have not merged any acquired source code into their product. The service-oriented architecture has been extended to add capabilities, new services add only the capability needed to support requirements without extra or duplicate functionality. For example, the workflow and security services are leveraged by all other services, there is no extra code. Perhaps the most

interesting point noted by Aras is that no subscribers have customized Aras web service code even though they have access to do so. This is a testament to the breadth and depth of Aras's services and one of the reasons Aras is able to include upgrades within their standard subscription service agreement.

While CIMdata has published much about Aras over the years, two publications clearly describe why CIMdata considers Aras to be a state-of-the-art product innovation platform. The commentary [Aras PLM Platform: Redefining Customization & Upgrades](#)¹ describes how the Aras PLM Platform can adapt to a wide variety of business needs that span industries and the product lifecycle. Second, the eBook, [Product Innovation Platform Assessment: Aras PLM Platform](#),² assessing the Aras PLM Platform against CIMdata's product innovation platform maturity model.

Conclusion

Digital transformation is a new term that describes improving business through the use of information technology and PLM capabilities, but it is not a new approach. PLM has been focused on this issue for several decades, and it a necessary critical element of any company's digital transformation strategy.

Few if any legacy architectures were designed to support end-to-end processes such as impact analysis and traceability. Most were developed to support silos in functional areas and have had extensions grafted on. While extending legacy solutions can work for a while, this eventually hits a wall and a new architecture is required.

At CIMdata, we believe business is at an inflection point, the evolution of business and customer requirements, as well as technology, are causing data volume and complexity to grow exponentially, and the growth must be addressed to ensure long-term business success. A digital transformation program with management of the product lifecycle data, based on a product innovation platform, at its core is the best path forward to ensure long-term success. The Aras PLM Platform belongs on a short-list for companies assessing their digital transformation requirements.

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.

¹ <https://www.cimdata.com/en/resources/complimentary-reports-research/commentaries/item/10115-aras-plm-platform-redefining-customization-upgrades-commentary>

² <https://www.cimdata.com/en/resources/complimentary-reports-research/white-papers>