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Adopting Public Cloud for Automotive Manufacturing Operations

An Infosys Consulting POV

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Executive summary

Emerging trends in the automotive industry, together with challenges of intense competition and COVID-19, have made the CIO's job ever more critical in the organization. Traditionally, CIOs were responsible for supporting operations improvement initiatives and reducing costs using IT solutions. In addition to these, modern automotive CIOs are also responsible for making the organization future proof through flexible digital transformation and modernization.

Manufacturing organizations are increasingly leveraging capabilities of cloud to transform their non-core operations. However, the use of cloud in manufacturing operations management (MOM) applications is at an early stage.

This point of view (POV) explores CIO's apprehensions in migrating MOM applications to the cloud and suggests a three-step strategy to mitigate these risks. The approaches recommended in this POV revolves around defining the cloud scope, checking public cloud feasibility for each MOM application, and supporting the cloud initiative through a robust operational organization.

Introduction

The global automotive industry is undergoing a transformation due to emerging trends like autonomous, connected cars, electrification, and shared mobility (ACES). COVID-19 has caused major disruptions in manufacturing operations, supply chain, and distribution. Margin pressures are the order of the day in this industry characterized by intense competition and leading innovation.

Supporting the business in managing COVID-19 related disruptions and staying customer-centric in the era of ACES, all the while minimizing costs, is thus imperative for automotive CIOs.

The top priorities of global automotive CIOs can be categorized into three areas:

1. Improving operational performance and visibility

2. Optimizing costs of immutable infrastructure

3. Preparing and enabling the organization for digital transformation

Cloud adoption proves pivotal in supporting these objectives. Business benefits of using the latest technologies like AI/ML, image processing, and analytics can prove vital in improving production operations. IT benefits of scalability, cost effectiveness, and security provided by cloud-based solutions are well documented however they are not part of this POV. Indeed, automotive companies have increasingly adopted cloud in multiple areas of value chain in recent years.

Figure 1 shows the levels of cloud adoption in different stages of automotive value chains.

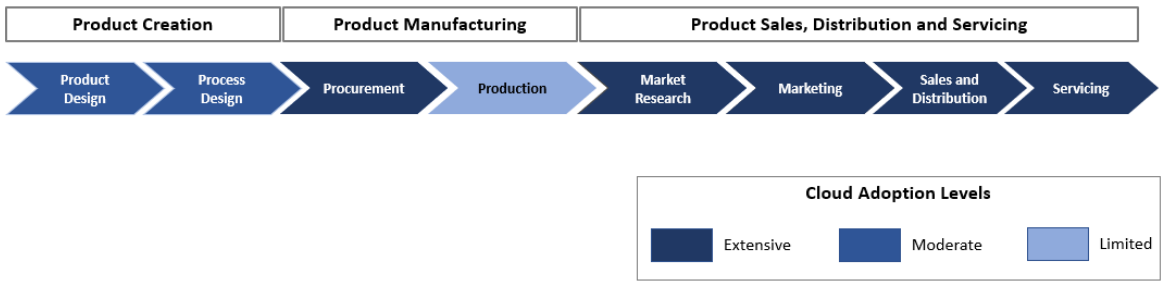


Figure 1: Cloud Adoption in Automotive Value Chain

It is often observed that cloud adoption, which is prevalent in sales, customer service, and procurement stages, is limited in the production stage. Manufacturing IT applications that support the production process have been traditionally implemented as local instances, in assembly plants or in centralized on-premise data centres. IT teams cite two key reasons behind this decision:

1. Availability requirements: Advanced manufacturing plants of automotive manufacturers produce an average of 200 cars per shift. Therefore, even a downtime of a few hours of mission critical MOM applications, which directly control the production process, translates to production loss worth hundreds of thousands of dollars. Perceived cloud availability and network latency issues have historically deterred manufacturers from hosting their MOM applications on public cloud hyperscale's like AWS or Azure.

2. IPR protection requirements: Production data and its associated IP are highly classified by its intellectual nature. Manufacturing organizations have been sceptical about the cloud's general ability to maintain data confidentially and integrity of the CIA Cloud Security Triad.

However, recent cloud transformations in ERP and PLM systems and advancements in network technology have proved that cloud-based solutions can effectively address both these requirements. This has encouraged CIOs to initiate cloud transformation programmes of MOM applications. This POV shares thoughts about a three-part strategy that CIOs can adopt to maximize the benefits of cloud in MOM applications.

1. Cloud scope definition

Before embarking on a cloud transformation journey, it is critical to align the IT application strategy with functional business objectives. Once the business objectives are defined, the MOM applications that support the new functionality need to be identified. Business objectives can be addressed by IT in one of the four ways as shown in Figure 2.

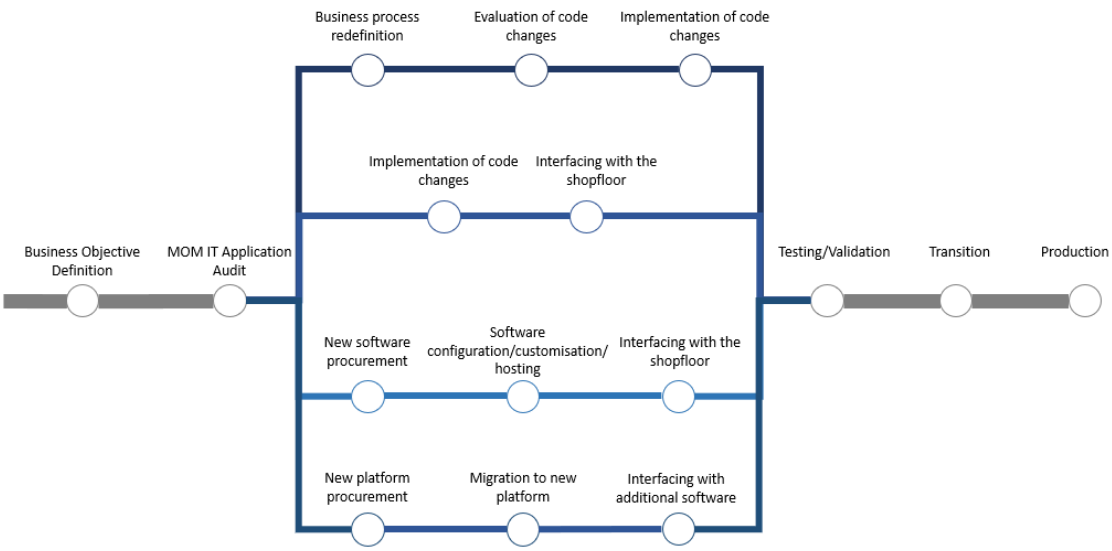


Figure 2: MOM IT Application Strategy Options

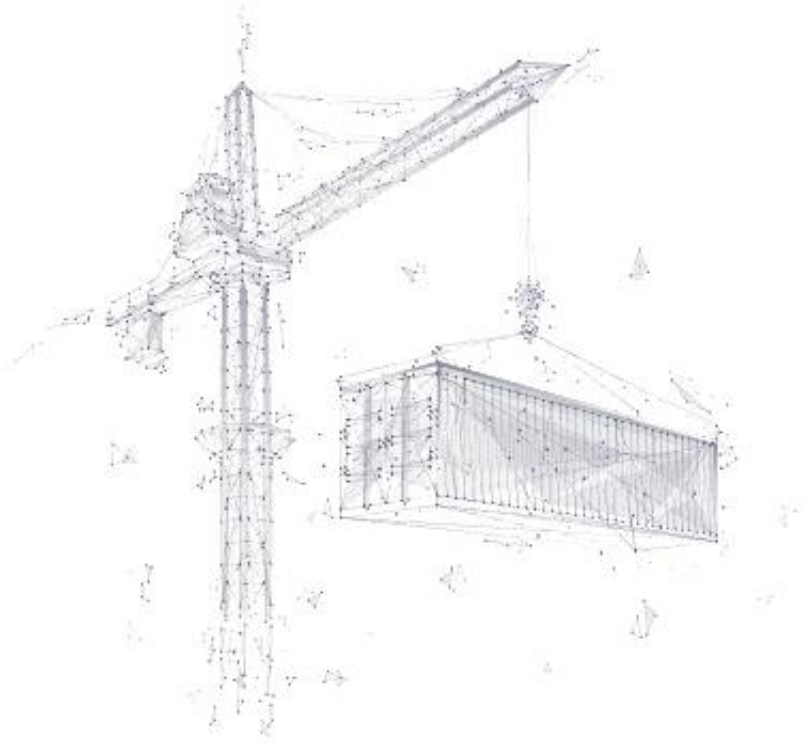
I. Business process redefinition: Some use cases can be addressed by examining and redefining the business process. In this case, MOM IT applications need to be tested for these use cases. No major changes in code or hosting philosophy is required.

II. Code changes: Some use cases may require changes in sensors or actuators on shopfloor and this may necessitate code and interface changes. However, it may be prudent to keep the hosting philosophy the same.

III. IT application replacement/new software implementation: Some use cases cannot be fulfilled by the existing software. These are typically the cases where new functionality that is not supported by the now obsolete software is required. In such cases, the only option is to replace the existing software with state-of-the-art software. It is also important to assess the hosting philosophy for this new software and evaluate if cloud could add value.

IV. Hosting philosophy redefinition: Some use cases require analysis of data using the latest technology and accordingly taking production related decisions. For example, business cases related to predictive maintenance using AI and analytics. In such cases, it is important that historical data from multiple plants is gathered and analyzed. Localized MOM IT application instances may not support these requirements and cloud is the way forward.

Cloud hosting can add value in the last two of the four scenarios mentioned above. It can also be a good option if the objective is simply to reduce IT costs. MOM IT application audit and classification is key in defining the application strategy to achieve business objectives using cloud in a cost-effective way. It is also useful whilst prioritizing the applications for cloud migration. Auditing the MOM IT applications requires both the business process expertise and technology knowledge.



2. Cloud feasibility check

Next step after the MOM applications audit is to check the feasibility of cloud hosting for each identified application. MOM applications represent Level 1 to Level 3 of the ISA95 architecture shown in Figure 3. These applications directly control the production process.

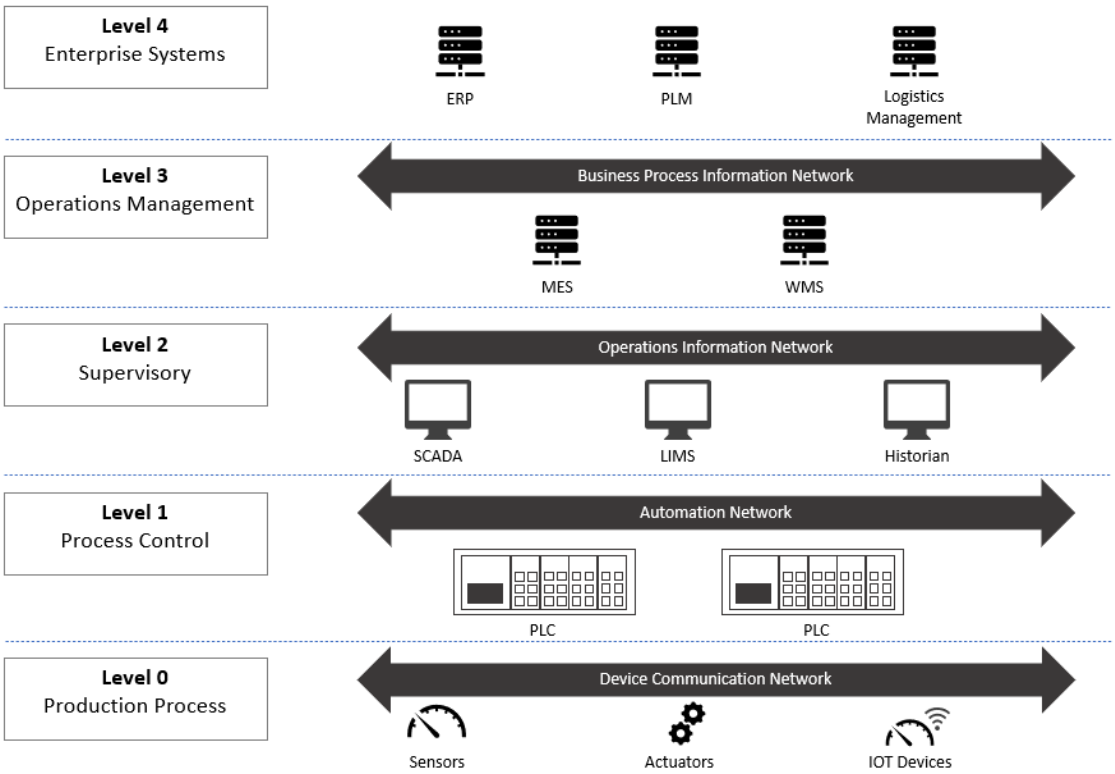


Figure 3: ISA95 architecture

CIOs are apprehensive about migrating these systems to cloud because compromising their availability, data security, and response speed could impact the production process. Therefore, most manufacturers run the MOM applications as local instances in the plants. They build local data centres to manage production processes using these applications. Although this architecture addresses the availability, latency, and data security issues, it leads to increased upfront costs and scalability challenges that comes with immutable infrastructure.

Despite the obvious native benefits, cloud migration may not be the right solution in certain instances due to latency issues and the amount of real time data that these systems generate. Some of these systems are mobile in nature and may lead to problems with network availability and latency. Cloud feasibility checks may help in deciding which applications or what data from those applications should be moved to cloud. For example, it may be more pragmatic to move the genealogy and quality related data from MES to the cloud and purge the remaining, non-essential data locally after certain period. It may also be more prudent to implement a hybrid cloud strategy, in certain instances. Some MOM application service providers have also started offering SaaS models, which could prove beneficial in certain instances. These applications, mainly related to reporting, dashboarding, and analytics could be more cost effective when used as SaaS. In this way, manufacturers can implement cost effective cloud solutions that help realise expected business benefits faster.

It is also worth evaluating new next generation low latency network protocols for metro cloud services that incorporate 5G for URLLC - ultra-reliable low latency communications - for remote plant manufacturing equipment with high data volumes and low latency requirements.

A cloud feasibility check should be application centric. It should understand the functionality supported by each application and then recommend the feasibility of moving entire application or part of it to the cloud.

3. Supporting IT operating model

Choosing the right IT operating model, including the cloud product, implementation and support partner, and owners within the organization is key to successful cloud implementation of MOM applications.

Since MOM applications are mission critical, procuring the cloud product is important in post implementation use and success of the application. Many manufacturing organizations have started forming digital transformation offices reporting directly to CIOs. A cloud Center of Excellence (CoE) team within the digital transformation office can add tremendous value to the organization’s cloud initiatives.

A CoE should have following responsibilities:

- Define cloud strategy and ensure timely implementation within quality standards
- Be the interface between the business and the suppliers such as cloud service provider, infrastructure suppliers, and implementation and support partners
- Be relevant on the latest trends and features available that could benefit MOM applications

Procuring the cloud consultancy, implementation, and support services from a partner who has the business process expertise and understands the criticality of MOM IT applications is of utmost importance for the success of cloud transformation. Consultancy partners should analyse the customer's existing application landscape thoroughly and recommend solutions in an unbiased and flexible way. Implementation and support partners should have experience of implementing such solutions and have the highest competency levels of cloud as well as the MOM applications to avoid the common pitfalls of such transformation initiatives. As with any IT initiatives, having the right organization leading the cloud initiatives, supported by capable GSI and Alliance partners, along with a collaborative business team is key to successful cloud transformation of MOM applications.

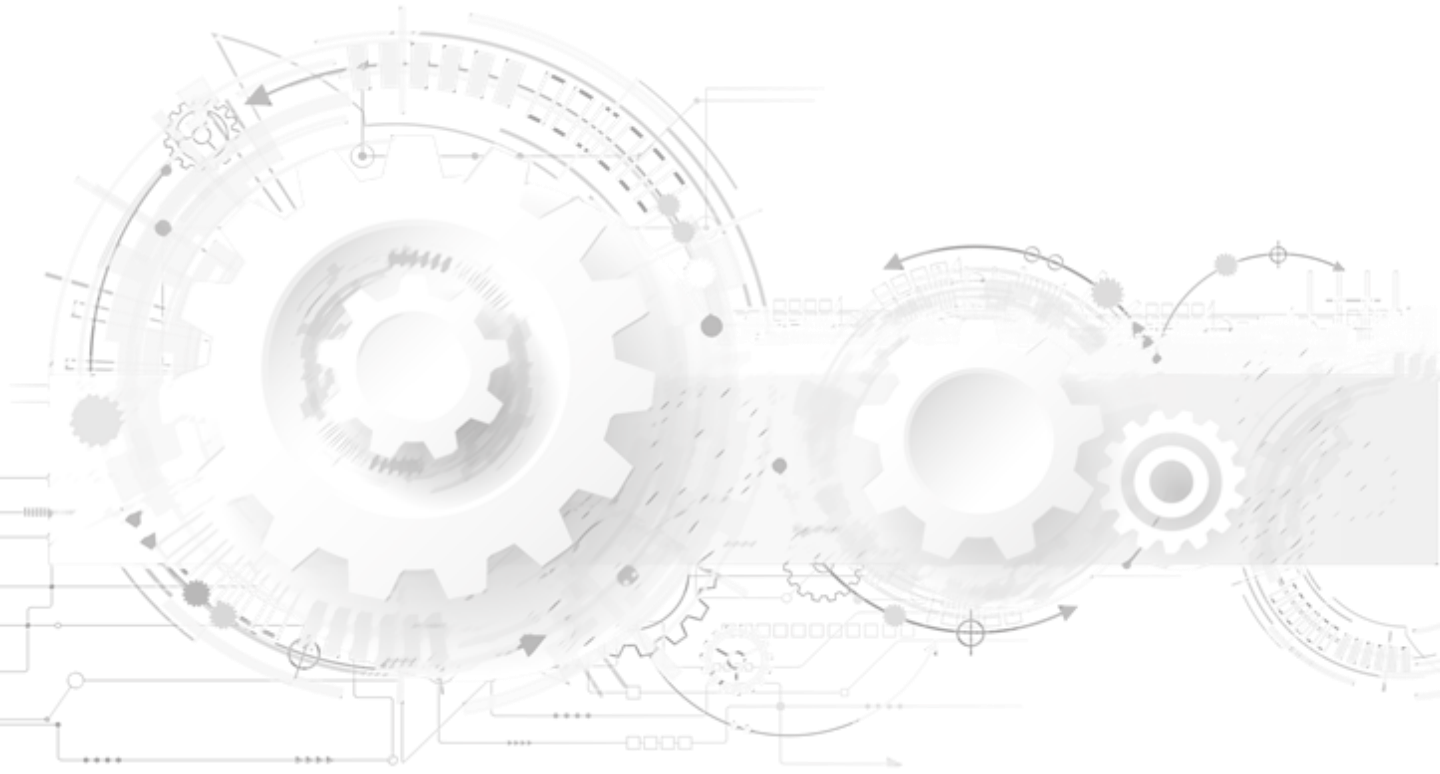
Summary

To summarize, MOM applications are complex, covering a large technological landscape, and have interfaces with multiple systems that update the data in real time. Cloud transformation of these applications can help in achieving business goals of higher productivity, efficiency, and better quality as well as IT goals of cost effectiveness. To achieve this, manufacturing organizations need to:

1. Align the cloud strategy with business objectives to clearly define cloud scope.

2. Check the feasibility of implementing cloud solutions and define an application centric roadmap.

3. Form an organization that can support the initiative in an agile way.



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