

IoT as a Force for Re-imagination

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Summary

Earlier this year, ARC Advisory Group participated in a well-attended IoT forum in London, England organized by Tata Consultancy Services (TCS). During the plenary session, TCS executives discussed the industry's readiness for the Fourth Industrial Revolution. TCS sees IoT as the force behind

TCS considers three maturity stages in the adoption of digital technologies: digitalization of assets; digital transformation; and digital re-imagination, which involves completely new business models such as customized mass manufacturing or executing the manufacturing process by IIoT systems.

re-imagination of the industry, which will have particular impact on product development and predictive analytics.

Following the plenary session, participants broke out into workshop-type sessions on either connected products and manufacturing; connected consumers; or connected travel, transport and supply chain management. In the connected products session, ARC presented on paperless manufacturing in the connected products section and had an opportunity to interview Sreenivasa Chakravarti, head of Innovation & Transformation Group for the Manufacturing Industry Solutions at TCS.

Innovation and Transformation for Manufacturing

In our conversation with Mr. Chakravarti, we discussed the forces that shape modern manufacturing and its value chain. TCS looks at manufacturing operations as a lifecycle that starts with mass manufacturing and then goes through phases in which productivity and quality are optimized. In the future, TCS expects a more tightly woven web of connected customers and processes. Today, Industrial IoT (IIoT) enables near real-time demand signal processing and the capability to deliver individualized



products, also referred to as “segment of one,” which represents the ultimate production agility for a manufacturing supply.

TCS believes that legacy systems in brownfield plants are a major hurdle to end-to-end digitalization. TCS sees its role as an IT services and consulting firm to facilitate the integration of those plants into the digital ecosystem. This includes providing architecture, including key technology strategic components such as a service bus, and connectivity to access data in traditional historians and equipment. The transition will happen gradually, guided by ROI for each investment phase and should deliver relatively quick payback.

Responding to our question about why industry appears to be so slow to adopt IoT despite the increasing number of supplier solutions, Mr. Chakravarti mentioned that the manufacturing environment is a complex system of systems for which it can be challenging to foresee all the possibilities and their consequences. TCS proposes using “virtual simulation” to better understand the behavior of the system, identify bottlenecks in the information flows, and deploy appropriate solutions. He considers this approach a key to help organizations effectively manage digital transformation.

Mr. Chakravarti commented that plants will continue to be measured against the same KPIs as in the past: OEE, yield, quality, safety etc. Digitalization pushes these parameters closer to the target values. Digitalization will also enable organizations to improve responsiveness, collaboration between members in the value chain, and increase compliance, while reducing the cost of making the improvements.

The manufacturing environment is a system of systems, and it is difficult to oversee which change makes the right impact, unless “virtual simulation” is used to understand the behavior of the system, identify bottlenecks, and remove these in a targeted manner.

Commenting on the roadmap to maturity for adopting digital technologies, Mr. Chakravarti explained that TCS considers three maturity stages: digitalization of assets, digital transformation, and digital re-imagination.

In the first stage, assets, products, and processes are digitalized to streamline existing business processes.

This could include paperless manufacturing and compliance. In the second stage, digital transformation, business processes are revamped and new user experiences created by deploying mobile devices, social collaboration,

or analytics. An example would be predictive maintenance using machine learning to predict failure of equipment. The third phase, digital re-imagination, involves completely new business models. This could be customized mass manufacturing or executing the manufacturing process by IIoT systems. Plants could also leapfrog to higher levels of maturity without going through all stages.

We also discussed the challenge that the fast-changing technology landscape poses for decision makers and agreed that plants or companies need to select carefully those technologies and methodologies that correspond to their strategic intent and plant needs. They should avoid building another complex landscape, thereby replacing old legacy with new legacy systems and, instead, focus on scalable, expandable and maintainable solutions. Here, high degrees of interoperability and standardization are key.

Connected Products and Paperless Manufacturing

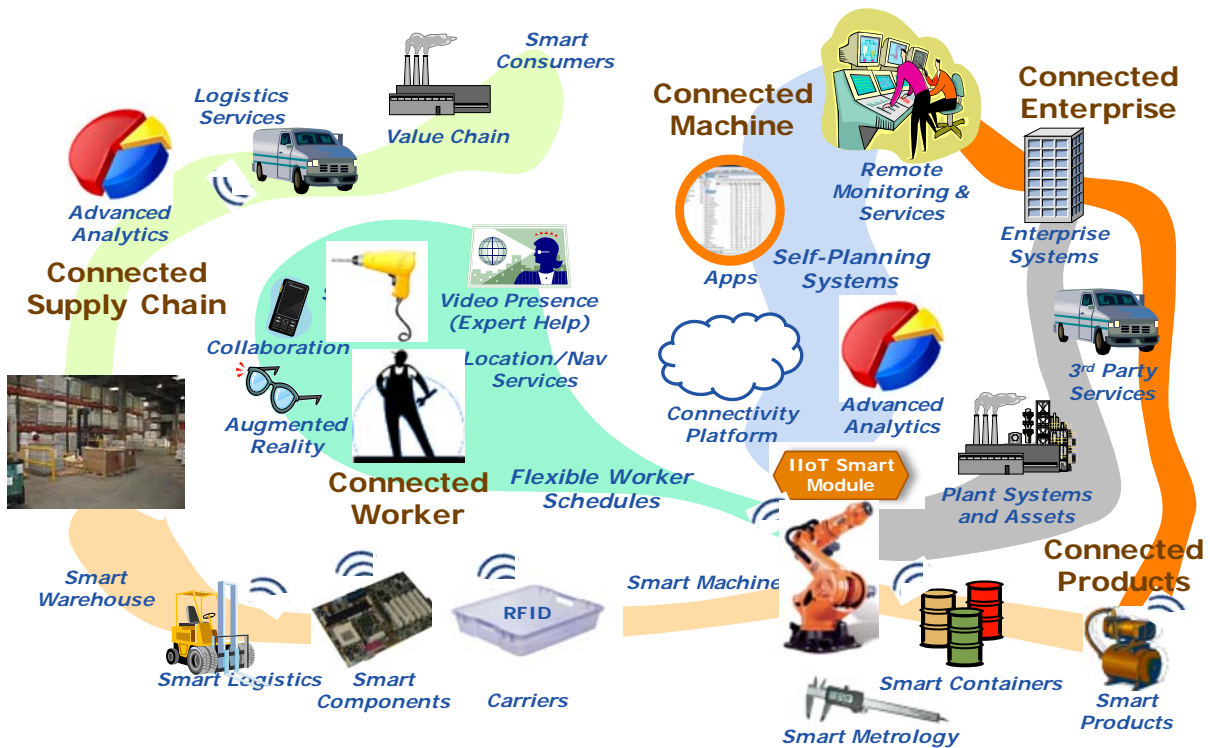
ARC's "Paperless Manufacturing" presentation resonated well with the previous discussion. In the presentation, we stressed that the need for innovation increases as manufacturing becomes more complex and competitive.

Since a competitive manufacturing base creates growth and builds resilience into the economy, governmental organizations worldwide (supplemented by industry-led organizations) have started initiatives to stimulate industrial innovation and increase competitiveness and growth. Some initiatives, such as Industry 4.0 or the Industrial Internet Consortium (IIC) focus on discrete manufacturing. Others, such as the Smart Manufacturing Leadership Coalition (SMLC), focus more on the process industry. However, concepts from either group can add value to any industry. Smart manufacturing technologies, including digital representations of equipment, products or processes; and intelligent digital technologies can be applied to three operational domains:

- Asset lifecycle management (ALM) and product lifecycle management (PLM)
- Manufacturing operations
- Supply chain operations

ALM should be supported by seamless asset lifecycle information management (ALIM). Ideally, this provides an accurate and up-to-date digital image of the plant at any point in the lifecycle from the design, engineering and construction phases; through the operation and maintenance phase. Effective ALIM increases the accuracy of “as-maintained” information to enable safe operation and reduce both maintenance and compliance costs.

We’re seeing an emerging technology landscape forming in manufacturing. This includes smart equipment connected to industrial asset analytics and internal staffs or third-party service providers. Operators use smart tools and connected methodology to be more efficient and accurate. Both inside and outside the fence, smart logistics and warehouses connect to a smart supply chain. Analytics applications taking in data from connected consumers and production facilities enable improved decision-making.



Emerging Smart Production Environment
 Source: ARC Advisory Group

Today’s decreasing product lifecycles combined with volatility in markets, demand, and pricing call for increased manufacturing agility. ARC expects supply chain volatility to increase. As a result, it’s likely that supply chain-related predictive and prescriptive analytics will become more important to

dampen the impact. With more connected vehicles and vessels, supply chain decisions will be made more proactively than today. IoT initiatives, such as SMLC, are investigating new application architectures for supply chain management intended to reduce implementation times for these applications from years to months.

Conclusion

From what we learned at this TCS forum, it appears that the company has a strategic approach to digital transformation, combined with a rational, ROI-driven investment approach. Both are good things.

We support the company's strategic approach to assess the maturity of manufacturing and supply chain operations in the context of smart manufacturing and IIoT technologies, and associated business models and processes. This approach enables organizations to implement a strategic plan gradually over time based on their business priorities, which creates returns at various points along the road. Digitalization will enable companies to bring their plants closer to their KPI targets, facilitate this process, and reduce costs.

It is important to choose any technology or implement business changes carefully. As TCS proposes, techniques such as "virtual simulation" could help avoid creating new legacy applications. Instead, the technological strategic goal should be to build extendable, interoperable, adaptable, and maintainable solutions.

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