ABSTRACT

Customers are demanding ever-higher levels of service and quality. Agile manufacturing that can meet rapidly changing needs is becoming an expectation. Lean Manufacturing requirements to reduce losses and improve productivity have never been higher. Sustainable manufacturing, including reducing waste to landfills, use of 100% renewable energy, and minimal water usage, will likely be increasingly required.

At the same time, a Fourth Industrial Revolution is underway with the automation of manufacturing through the Internet of Things, cloud computing, artificial intelligence, additive manufacturing, and robotics.

Web Handling systems are poised to address these challenges and leverage the opportunities. These systems are commercialized additive and subtractive systems including fluid and solid printing on moving substrates, multi-layer lamination and shaping via slitting and other cutting operations. Material delivery in wound roll form is an efficient space and conversion method to finished products to meet customer demand and optimize supply chains. Software and computing capabilities continue to advance to enable realistic simulation of web handling systems. With reductions in sensor costs and data storage, web handling systems can be well-instrumented to provide opportunities for machine learning and artificial intelligence.

Technologists can influence their organization towards inspiring opportunities by creating with management partners and other stakeholders a vision, strategy and migration path, prototyping the building blocks and integrating them over time to gain the cultural changes needed for success. Visionary leadership, broad and deep curiosity, strategic and systems thinking, passion and persistence are useful traits for technologists on this journey.

In modeling and simulation, creating tools for entry-level practitioners, advanced practitioners and experts will facilitate adoption. Applying these tools in situations where physical testing is impractical or costly and towards the highest-value goals is a particularly effective approach.
Modeling/simulation combined with expert domain knowledge can provide the framework for what to measure and how to measure it in physical systems. This provides the basis for the data model and architecture needed to store and process the data. Knowing the stakeholders and end users of the data will define the appropriate user interfaces, how the insights are communicated and the decisions that may be made. Treating models/simulations as digital assets to be maintained will keep them useful over time.

Ultimately, integrating the building blocks of modeling/simulation, sensor data and predictive analytics, and automation into design, development and manufacturing work processes will reap the most value for organizations and doing so in a staged approach towards the vision limits investment risk and enables cultural change to happen.