

Sharing for Agility – Blue Sky Submission

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Markets today are becoming more segmented, demand more volatile, and consumption more global than ever before. Mass customization is increasing the complexity of requirements in the supply network. Orders can come from nearly anywhere in the world, with an expectation of short lead times for full customization. To meet these requirements, many aspects of the product realization process will need to transform. This transformation will be fueled by the exponential growth in data availability and computing power. Transformation will occur in the product engineering, supply chain planning, manufacturing execution, and quality management fields.

The vision is to utilize “sharing economy” principles to enable the flexing of global production schedules and/or physical capacity to fully burden assets and plant capability. Two major areas of manufacturing inefficiency need to be addressed. First, enabling the manual operators within our manufacturing footprint to flex seamlessly between job roles without taking a significant cost and quality hit. Easy to follow, in-situ work instructions perhaps on an augmented reality platform are key to ensuring a shortened learning curve. Historically, significant engineering time is spent to deliver high quality work instructions. Leveraging data rich engineering models and digital representations of our manufacturing footprint, many of these costly tasks can be automated and improved.

Second, there needs to be an intense focus on maximizing the utilization of capital resources. Historically, fixed assets and dedicated production lines have delivered strong results when demand is constant. When demand fluctuates, they become an economic boat anchor. Reconfigurable assets that can be used seamlessly regardless of product mix or assets that can be shipped between facilities will greatly improve the ability to respond to volatility in demand. To realize this, we must attack the extensive period costs associated with the manual intervention required to keep automated cells running. Programming must be performed at a higher level, to the point of self-programming assets that leverage the data rich engineering models and advanced vision and sensing technologies. Manufacturing engineers will have the tools to respond immediately to build what the customer demands with accurate, validated manufacturing plans. Tooling and work holding designs will be automatically generated.

Additionally, global manufacturing investment and productivity gains have resulted in excess capacity without the dynamic ability to easily sell time. Traditional, static supply networks will transform to take advantage of this global capacity and capability. Current supply networks are meticulously designed for certain lead times, certain throughput levels, consistent routings, dedicated assets, and with long-term negotiated costs. To thrive in a global world, filled with uncertainty, and to take advantage of available assets, production orders will be routed through dynamic networks of constantly changing suppliers in order to deliver the best products to the customer at the right time. In addition to flexing with region and allowing surges in the capacity, this approach will also improve the resiliency of the supply network to external disturbances, such as natural or geo-political events.

To enable the production flexibility that is needed, both product and process data will need to be linked through the engineering models and comprised of foundational building blocks that can be recombined based on the specifics of the chosen production routing. The creation of manufacturing models, control plans, work instructions, etc., will be automatically generated from more basic information. Engineering requirements will become better defined in models, and manufacturing engineering and equipment with the help of machine learning algorithms will become more intelligent to define processes that meet these requirements. Additionally, the quality management functions will change to enable more agile product realization. As sharing economy aspects become more prevalent in non-work transactions, risk management procedures will evolve in corporate transactions as well. Collective progress in all of these fields will enable a more dynamic, more profitable, more sustainable manufacturing eco-system of the future.