How can decision support aid smart manufacturing initiatives?

Experiment Findings · April 2018

DOI: 10.13140/RG.2.2.10292.76162

CITATIONS
3

READS
315

4 authors:

Daniel J. Power
University of Northern Iowa
95 PUBLICATIONS **8,447** CITATIONS
SEE PROFILE

Marzieh Khakifirooz
Tecnológico de Monterrey
59 PUBLICATIONS **553** CITATIONS
SEE PROFILE

Michel Fathi
University of North Texas
113 PUBLICATIONS **758** CITATIONS
SEE PROFILE

Panos Pardalos
University of Florida
1,728 PUBLICATIONS **48,294** CITATIONS
SEE PROFILE

: How can decision support aid smart manufacturing initiatives?

by Daniel J. Power

Editor, DSSResources.COM, University of Northern Iowa, USA;

Marzieh Khakifirooz, National Tsing Hua University, Taiwan;

Mahdi Fathi and Panos M. Pardalos, University of Florida, USA

Manufacturing in developed nations must incorporate more data capture and decision support to control costs and maintain product quality. Digital transformation of manufacturing means production must be transformed using technologies like robotics, Internet of Things (IoT), Intelligent systems, and real-time analytics. Smart manufacturing means all aspects of production are transformed so they are data, computing, and decision support intensive. Smart manufacturing has been defined by i-SCOOP.eu as the "fully-integrated, collaborative manufacturing systems that respond in real time to meet changing demands and conditions in the factory, in the supply network, and in customer needs." Various decision support and data-driven capabilities must be incorporated in smart manufacturing systems, including:

Data-Driven DSS

Big Data Management in the Cloud can improve data management and distribution for both “machine-generated data” and “human-generated data.” Real-time automated fault detection, classification and root-cause detection should be optimized using data from sensors. Finally, data-driven DSS should integrate real-time and special study data analysis. New and expanded data sources can enhance predictive analytics and output can be quickly shared using visualization tools.

Knowledge-Driven DSS

In a smart manufacturing environment, sharing expert domain knowledge at the manager-operator and operator-machine interface level is very important. Recommender systems and opinion mining can support real-time data-based decision making. Machine/user relationship mining and clustering can increase the self-awareness, self-learning, and self-maintenance of production systems. Finally, Reciprocal Learning-Based DSS (RL-DSS) can make repetitive decisions and reduce the human decision making load. Routine decision tasks can be learned and programmed. Then decision makers update their knowledge and help create more intelligent decisions than previously possible for semi-structured decisions.

Model-Driven DSS

Factories of the Future (http://www.effra.eu/factories-future) require integrated supply chain management, improved demand forecasting, and technology integration throughout the supply chain management process. Sensors combined with quantitative models can reduce costs and identify faults in the supply network itself, such as sensor failure and degradation. Ideally models will optimize the frequency and timing of sensor measurement and will eliminate or reduce supply chain network delays.

Creation of an Intelligent Feedback Control System can improve product quality and can provide feedback for system management, which can be used to improve production scheduling, to maintain machinery, and improve proactive maintenance.

Communication-Driven DSS

More machine to machine decision support can facilitate sharing machines for different tasks or under different conditions. Developing simulation tools can help train operators and decision makers, prevent impending problems, and help in taking corrective action in a timely manner. If Artificially Intelligent machines communicate, security challenges will increase, but shared decision making will increase in the production network.

Smart manufacturing requires intelligent systems and decision support for human participants.

References

Korak, L., "Preparing for the Factory of the Future," IndustryWeek, April 20, 2016 at URL http://www.industryweek.com/emerging-technologies/preparing-factory-future

Leiva, C., "What Is Smart About Smart Manufacturing?" Automation World, October 19, 2017 at URL https://www.automationworld.com/article/topics/industrial-internet-things/what-smart-about-smart-manufacturing.

"Smart industry and smart manufacturing – industrial transformation," i-SCOOP at URL https://www.i-scoop.eu/manufacturing-industry/.

Author: Daniel Power
Last update: 2018-04-08 05:09