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The future of smart manufacturing and how to proceed in order to make it a reality

A popular scientific summary

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Modern manufacturing facilities are filled with technology and we are at the verge of a breakthrough in the smart manufacturing domain. The massive increase in computational power inside these factories, combined with advancements in cloud computing and connectivity through the "Internet of Things" open for new, highly interesting solutions. The question then becomes how to systematically integrate these technologies in a modular, efficient way to prepare the industrial companies for the next revolution of manufacturing.

Ultimately, industrial manufacturing companies want to gain deeper insight in the different processes of their businesses, ranging from hands-on operational processes up to business logistics and strategic enterprise processes. This can be achieved through large amounts of data from sensors and systems scattered across the company. The data can come from a variety of different sources, it could be manufacturing data from the machines and robots on the shop floor, such as temperature, voltage levels, defects in the end products, etc. It could also be data from orders from customers and such.

These data entries could then be fed to some sort of analytics engine; a kind of software that could spot very small changes in processes and propose future actions much faster and more accurately than any human could. The big problem, however, is that these systems could be hard and time-consuming to set up correctly, due to differences in how manufacturers construct their systems.

The motivation for this project has been to identify some systematical way of proceeding into a data-driven

manufacturing routine, where business decisions could be automated with the help from analytics. The study presented its results as four distinct project recommendations that could be conducted in the future. These recommendations heavily emphasized general data structures, rather than focusing on higher level analytics algorithms, as a solid foundation is far more valuable in the initial stages. The resulting projects started with a general framework for discussing future development strategies. Then, a project for generic information modeling of machines and other assets were discussed. Following this, a suggestion for more advanced machine-to-machine communication structures were presented, and lastly some higher level analytics algorithms were discussed.

While not being tied to a specific project, the most important conclusion from the thesis work is that the future will be shaped most efficiently through heavy collaboration with other companies and organizations. Increased transparency and collaboration combined with decreasing competition amongst companies, will contribute to a much faster development in the manufacturing domain.

The analyses and conclusions made in the thesis have been based on a broad and thorough literature study from a wide range of subjects within the smart manufacturing area, combined with discussions with expert in manufacturing and "Internet of Things" from Scania and PTC. The study was conducted at the Department of Automatic Control at Lund University.

REFERENCES

- [1] Axel Lundholm, *Accelerate Business Value in Manufacturing with Advanced Analytics*. (2019). MSc Thesis. ISRN LUTFD2/TFRT-6089-SE ISSN 0280-5316, Media-Tryck, Lund University, Lund, Sweden. <http://www.control.lth.se>