OCF

Data Analytics

The Internet of Things and the Future of Manufacturing

A White Paper by OCF

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Executive summary

Although manufacturing has not been the fastest adopter of new technologies, the new wave of smart devices – devices connected to the Internet and to each other – will experience fast uptake and result in a step-change in both productivity and profitability. Reduced maintenance costs, greater on-time delivery of both components and finished goods, and highly integrated supply chains are just a handful of the benefits that manufacturers stand to accrue from the Internet of Things and the data those things will create.

As with any new technology, the first steps will be tentative, but those who fail to take them may be swamped by waves created by those who do – those who see the potential for greater efficiency, customer satisfaction and reduced costs feeding through to the bottom line.

This white paper explores these issues, and is designed to be read by those interested in the future of manufacturing and how to get there.

Introduction

Market forces and innovative, enabling technologies are creating new value-creation opportunities in manufacturing. This means manufacturers have an urgent need to rethink nearly everything, such as how products are created, operated, and serviced. Failure to do so could place competitive advantage at risk.

For manufacturers, this centres around the Internet of Things (IoT), the phenomenon where all devices talk to each other. It means we will have as much – maybe more – data as we could possibly want about our environment and the objects we use every day, both as consumers and in business.

But there's more to the IoT than the objects themselves, intriguing though the phenomenon is. There's a number of processes, ideas and business logic that need to be injected into what could otherwise become an undifferentiated morass of data in order to make sense of it all. This is particularly the case in manufacturing, where the optimisation of physical processes can make the difference between profit and loss.

Manufacturing challenges

Any discussion concerning manufacturing's future must address the four key challenges the sector faces:

1. The ability to attract and retain skilled labour. Like other sectors, the UK manufacturing industry has suffered recently from a lack of skilled labour and this is affecting the ability of manufacturers to compete and grow in their respective markets.

2. Increasing global competition. Today, the global availability of cheaper materials, lower labour costs and skilled workforces allows organisations to move production anywhere in the world. This has resulted in the globalisation of supply chains, as firms compete for business.

3. Increasing pressures to reduce costs. Manufacturers are under significant commercial pressure to deliver more, and to do it quicker and cheaper.

4. Adaptability to shifting customer requirements. Given globalisation and cost pressures, organisations are now finding they have to adapt to changing customer needs by becoming more dynamic and predictive in their dealings with their customers.

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30 billion devices

Solutions

A key solution to these challenges is the adoption of what have become known as big data technologies. In order to compete globally, to attract and retain the brightest and best, reduce costs, and be adaptable to changing circumstances, manufacturers need to be able both to more thoroughly analyse the data they already own, and to gather more data to further enhance their decision-making.

More meaningful information, which is derived from big data, allows a manufacturer to be more agile and responsive to changing demand and circumstances. The more accurate the information, the greater the ability of managers to steer the business towards further success. That accuracy is being achieved by the increasing volumes of data originating from connected devices, which report on such matters as the physical environment, and the location and condition of components and other objects.

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This proliferation of connected devices means asset health can be monitored, and failure modes predicted and planned for, rather than replacing units according to a rigid schedule, or upon failure. It brings the ability to perform predictive maintenance because the tools to analyse the data they produce were not previously available. This visibility and predictability into your assets' health and performance brings both the ability to maximise asset productivity, and the assurance that the associated processes are as efficient as possible.

In addition, this hyper-connectedness can transform the logistics of manufacturing, allowing degrees of integration with the supply chain – upstream and downstream – that were previously impossible. It also enables greater coordination with increasing numbers of interested parties, and a global outreach. Just-in-time delivery becomes a reality, so inventories are precise, allowing manufacturers to hold no more and no less than required at any one moment.

Real world modelling

In order to extract maximum efficiency and utility from this new paradigm, business process experts at McKinsey believe that manufacturers need individuals who can design both algorithms that are robust, and user interfaces that allow users operating the system to recognise problems and to react without becoming tangled in a web of interdependencies.[1]

This means finding software designers who can build an architecture of steering instruments – new algorithms and applications that inter-link millions of things in a stable fashion, synchronised across the entire value chain. It also requires a model that maps the millions of inter-connected things onto business processes in a format that IT can handle – a vision known as process2device.[2]

In practice, this entails physical devices becoming active elements in the business process as they deliver events and data, binding the physical and virtual realms closer together. As Heinz Derenbach notes: "This requires mathematical, domain, market, and context know-how. In the connected world, we cannot separate the physical world from business processes."[3]

The consequence of this is that every element of the manufacturing process – IT, parts, the manufacturing environment and the machines – will be a single, intensely interconnected process, so the production technology that controls the machines merges with the components' technical data; process and device will become inseparable.[4]

As an example of how this will work, a component – or even the raw material – will carry embedded information about its destination and final purpose, as well as the processes that need to be undertaken in order for it to complete its journey into the larger whole, and will be able to report deviations from the standard process.

Conclusion

Every business needs constantly to review its processes in order to contain costs and increase margins. As devices become more capable, connected and common, it will become increasingly possible to perform descriptive, predictive and prescriptive analytics using tools that are intuitive with no programming required. With such tools, users will be able to perform asset health modelling based on real-time event data, such as measurements, logs, alarms, and repair history, as well as detect product anomalies, uniformity issues, and outliers while providing lot inspection recommendations.

With this in mind as an end goal, it is clear that data will become even more of a key asset than it is today. This means the ability to store and access that data in a timely manner could make the difference between maintaining the status quo, or taking advantage of that key asset and outperforming the competition, whether in quality, customer satisfaction, responsiveness or superior design.

All that is needed now is a decision to embrace a new world of smart manufacturing where processes are able to predict – and in some cases even fix – any upcoming issues themselves.

We have taken a glimpse into the future of manufacturing and its processes – but this is not science fiction. We stand on the edge of the cliff, ready to fly.

1. The Internet of Things and the future of manufacturing, June 2013: http://www.mckinsey.com/insights business_technology/the_internet_of_things_and_the_future_of_manufacturing
2. Term coined by Bosch http://www.mckinsey.com/insights/business_technology/the_internet_of_things_and_the_future_of_manufacturing 3. Derenbach; op. cit. 4. ibid.