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Automotive | the way we see it

Production Control, Quality and Maintenance Analytics for Automotive Suppliers

Tier 1 automotive suppliers (Tier1s) can drive down costs by using big data and analytics – technology that has recently become much more affordable and more mature – to improve operations and plant maintenance. Potential benefits include increases of up to 15 points in overall equipment effectiveness (OEE), reductions of up to 20% in scrap and rework and up to 15% in maintenance costs, and lower material and energy consumption.

Suppliers need lower costs plus more agility and control

Since the 2008 industry crisis, the situation for Tier 1s has improved dramatically. The businesses are growing, often with most of the growth in newer markets such as China, which is already the industry's largest market.

The Chinese market presents challenges, however: Original Equipment Manufacturers (OEMs) are putting downward pressure on suppliers' prices, while their costs are increasing because of inflation. This situation poses productivity and efficiency challenges.

With good levels of profitability, companies are willing and able to invest in preparing for the future. This means increasing efficiency with the aim of improving margins – a challenging task at this point. Automotive suppliers have unique requirements not found in other types of companies. For example:

- Tier 1s have a large number of medium-value machines performing repetitive tasks. There is thus a diverse equipment landscape to improve.
- Tier 1s are unusually decentralized compared with most manufacturing firms. Plants are typically situated close to their customers, the OEMs, with a high degree of autonomy as to how they meet those customers' requirements; this poses difficulties in terms of standardization.
- Tier 1s are already extremely efficient. Virtually all have implemented lean and Six Sigma. This maturity makes it harder to move forward because the easier improvements have already been made.

Technology enables new approaches

Further improvements in efficiency can be achieved by using new digital technologies and techniques to optimize operations in real time. These techniques are often discussed under the headings Industry 4.0 and Factory 4.0 – umbrella terms covering a wide range of opportunities to increase automation, improve collaboration, and achieve advanced optimization in real time.

Using these advanced technologies and techniques gives a range of possible options for improving profitability. In our view, one of the most valuable investment areas is leveraging big data and analytics to improve production efficiency, quality and maintenance.

The basic idea here is to connect up machinery so that data can be collected from it, and then use this data to improve control of production and quality, and to anticipate maintenance needs better. This in itself is a major potential source of additional value.

Tier1s can now potentially collect data from a large number of disparate sources, analyze them with a view to enabling control simulations and near real-time analytics, and deploy predictive models. All this is now within the grasp of suppliers because the availability and affordability of such solutions is increasing. Tier1s can therefore access advanced techniques that were previously only worthwhile for higher-value, asset-intensive activities like operating aircraft engines or nuclear plants. (Formerly, such investments were only justified where the equipment under consideration exceeded a threshold of around €10M, whereas now they are viable with assets of just a few thousand.)

For automotive suppliers, the approach needs to address the requirement to manage large numbers of medium-value machines. The key is to have an industrialized way of deploying these solutions.

Potential benefits

Using big data and analytics approaches to improve the way production, quality and maintenance are managed makes it possible to become more proactive in adjusting machine parameters and triggering maintenance to prevent failure instead of waiting for machinery to break and then fixing it. This can achieve substantial benefits including:

- Overall equipment effectiveness (OEE), with improvements of up to 15 points depending on the current maturity of the company. These savings translate into increased output or reduced equipment acquisition.
- A reduction of up to 20% in scrap and rework.
- Better targeting of maintenance activity – doing the right maintenance at the right time can save up to 15% of maintenance costs.
- A reduction in raw material and energy consumption.

All this helps to increase profitability. In most cases, companies can expect to achieve payback within the first year of deployment.

Clearly, there is a big difference between this and the traditional Six Sigma approach, where it was necessary to spend up to six months setting up data collection and running the analytics before seeing any results. Today's solutions automate much of the work for operators, line managers, and production engineers.

How to implement the approach

Implementing this approach requires a series of complex actions:

1. Connect machinery to enable data collection
2. Implement big data and analytics capability
3. Embed insights into operational processes to drive operations and maintenance

"Data makes your briefcase heavy – insight makes you rich."

Niall FitzGerald, former CEO, Unilever

cited in automotiveIT.international

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Let's consider each of these steps in more detail. At each stage, we recommend a pragmatic approach that tackles one plant's specific issues, rather than an attempt to solve problems globally – although our approach is one that can easily be replicated and adapted to other plants later. We recommend an agile style of implementation based on a portfolio of specific solutions.

Step 1. Connect machinery to enable data collection

Before analytics can be carried out, it's necessary to find a practical way to gather all relevant information together in a standardized form.

Existing machinery, even if it is quite old, usually generates some data, but at present it's not always stored in a form that is easy to analyze and use. Similarly, machines usually have some connectivity, but communication is often not straightforward. The task therefore is to standardize communication so that data can be brought together into an easy-to-use format.

Connecting heterogeneous equipment can be complex, but becomes possible once the appropriate level of standardization is chosen. We find it's usually necessary to have three to four different physical interfaces to cover all the different types of machinery that are present in a plant. In certain cases there could be a need to retrofit very old machinery with appropriate sensor types for generating the required data.

It's also necessary to standardize the information that's collected so that it can be used and interpreted in the same way regardless of source. Master data management techniques are helpful here.

Step 2. Implement big data and analytics capability

As noted above, there is plenty of choice in this market. It contains large players such as SAP, IBM and Microsoft alongside pure plays like Predix, Pivotal, IP Leanware and Dataiku. Some have specific solutions for automotive companies. Provided you are able to navigate this marketplace, it should be possible to find the right solution for your company.

In making your selection, it's important to bring together a set of tools that enable limit the need for data scientists, who are a scarce and expensive resource. Some data scientists will be needed, but the aim should be to have them set up analytics models in such a way that they can run continuously, generating outputs that your production engineers can use.

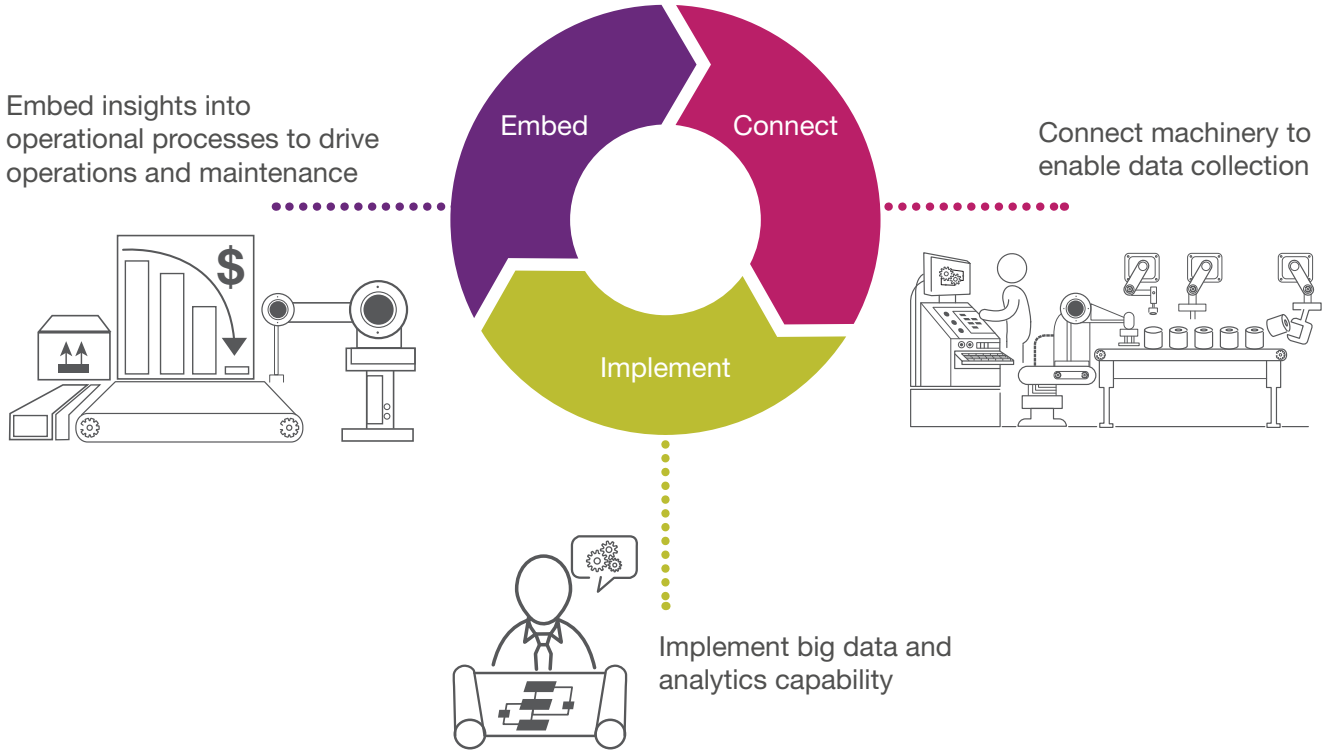
Step 3. Embed insights into operational processes to drive operations and maintenance

The point of collecting the data and creating the analytics is to be able to improve operational performance. The aim is to have automated monitoring that populates dashboards and sends predictive alerts, so that line supervisors can take appropriate action and generate benefits. For example, if the solution predicts that a piece of equipment is about to fail, a preventive maintenance action needs to be scheduled and performed.

The business needs to design and implement end-to-end integration to ensure a smooth flow of actions and feedback to the analytics solution. The objective is to ensure that the business acts on the insights, and that the system is continually learning and gaining experience from those actions.

The previous two steps focused on technology transformation, but the third one requires business transformation as well. If the insights are not acted on, they will not deliver benefits.

Figure 1: The 3 steps of implementation



Source: Capgemini Consulting

Start small, think global

We recommend a step-by-step approach that delivers early benefits and enables an organization to learn what works for the particular business.

Because this approach is new to the sector, there are not many examples to follow. We therefore recommend starting small, perhaps with a proof of concept (POC). By this we mean going through the whole cycle of connecting machinery, collecting, managing and analyzing data, and creating alerts and dashboards for just one machine or area.

Having done this it's then possible to evaluate the benefits, and define standards and processes for integration and data management, at minimal cost and with virtually no risk.

A global strategy for wider implementation can then be built. Within this strategy, it is best to continue to follow a step-by-step approach, finding solutions for specific issues. In the automotive supplier environment, this style of implementation works better than trying to impose top-down solutions. Gradually, you will have a wider range of tools and more insights into the ways that machinery can best be configured, operated and maintained, and into the operation as a whole.

This "start small, think global" approach is very powerful for Tier 1s. It contrasts strongly with the usual data management approach, which focuses on global solutions and standardization – an implementation style that does not suit suppliers' decentralized structure and heterogeneous environment. Our recommended approach does not impose a solution from above, but it still gives the opportunity to leverage group-level buying power.

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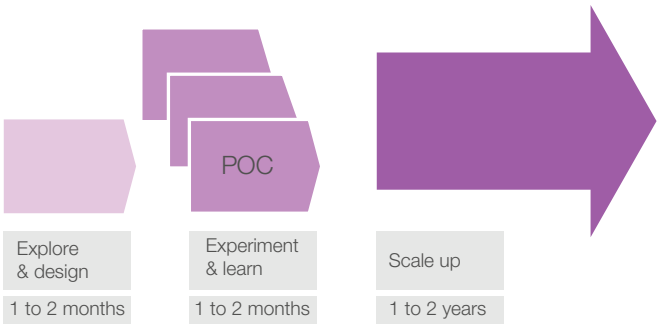
Figure 2: Typical duration of proof of concept



Source: Capgemini Consulting

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Put the business in charge

It's important to recognize that this isn't an IT project, but a business project enabled by IT. To stay on track, it must be driven by the business. Failure to realize this has caused problems for some companies, which have invested in putting information onto a big data platform but are not seeing the returns that they hoped for.

Next steps

Capgemini can help with every aspect – defining a business case stating possible outcomes and benefits, transforming business processes, and implementing the technical details of machine interfaces within the special environment of a Tier 1. In partnering with you to make this happen, we draw on your knowledge and our own, as well as on our ecosystem of solution providers.

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