OVERVIEW

Manufacturing firms globally are investing heavily in the adoption of Big Data techniques and systems that will drive them ahead of their competitors. Plant managers and engineers need no longer rely on experience and existing analytics to locate root causes or accept No Fault Found issues. New technologies, developed specifically for the manufacturing industry, are harnessing Big Data to deliver significant savings in COPQ, warranty resolution, life cycle costs, time taken to market and environmental impacts.
BIG DATA IN MANUFACTURING

Manufacturing stores more data than any other sector - close to 2 exabytes of new data i.e. a billion gigabytes, were stored in 2010 (McKinsey 2011). They also anticipate data generated from what is called the ‘Internet of Things’ (sensors and actuators embedded in physical objects) to grow at a Continued Annual Growth Rate of 35% per annum. Gartner echoes this by stating that more than 23% of manufacturing firms have already invested in technology for big data and 27% plan to invest in technology for big data during the next two years.

Big Data in the world of manufacturing is drawn from a multitude of sources, from instrumented production machinery (process control), to supply chain management systems, to systems that monitor the performance of products that have already been sold.

McKinsey suggests that manufacturers who harness the power of big data could enjoy a 50 percent decrease in product development and assembly costs and up to a 7 percent reduction in working capital.

Manufacturers are beginning to combine data from different IT systems such as computer-aided design, computer-aided engineering, computer-aided manufacturing, collaborative product development management, and digital manufacturing – some of the most powerful impacts of big data will come from the sharing of data across entire manufacturing lifecycles and supply chains.

APPLICATIONS

Although there are varying levels of maturity between sectors and even between companies in the same sector, there are indeed some pioneering companies and applications of big data already in existence in manufacturing industries.

Toyota, Fiat, and Nissan have all cut new-model development time by 30 to 50 percent through the collaborative use of data and modelling techniques; Toyota claims to have eliminated 80 percent of defects prior to building the first physical prototype.¹

Big data also enables innovative services and even new business models in manufacturing. For example, using sensor data BMW’s ConnectedDrive automatically calls for help when sensors indicate trouble and alerts drivers of maintenance needs, feeding the data directly to service centres.

ROOM FOR IMPROVEMENT?

Even leading companies with ostensibly optimised individual systems and utilising the most sophisticated quality techniques may still be losing up to 30% of their product sales value through the Cost of Poor Quality (“COPQ”), a figure substantially more than their profits. It would appear as though a glass ceiling has been reached when it comes to optimising individual processes and now we must unlock the information and hence the true value within the big data to optimise holistically across the manufacturing silos. This may be easier said than done, but there is a new corporate goal and vision.

Imagine getting it Right First Time every time, guaranteed quality, reduced warranty costs, reduced environmental footprint, and no product recalls that could potentially damage a brand or worse risk customer safety. These are all things that we have been striving for through the introduction of Lean Manufacturing and Six Sigma processes. Now technology is arriving that may truly deliver zero tolerance to failures.
**BARRIERS**

So what is holding us back? According to Tata Consultancy Services there are several factors: the top 5 recorded big data challenges for manufacturers are: 1. the level of trust between data managers and production managers; 2. determining which data to use for which business decision; 3. being able to handle the level and complexity of data available; 4. getting different departments and functions to share data; and 5. finding an optimal way to organise big data activities.²

**SOLUTION: SIGMAGUARDIAN**

SigmaGuardian from Warwick Analytics automatically locates the root causes of faults, and recommends the most beneficial actions without the need for hypotheses. It can work with incomplete and dirty data, and even resolve so-called “No Fault Found” problems, i.e. the intermittent, un-reproducible faults which keep engineers awake at night the most.

The algorithms within the software were developed following a decade of academic research in the US and UK. The software analyses any and all data that is available. Such data can come from across the entire enterprise and can include but not be limited to; all of the process and testing equipment, MES, ERP, Warranty tracking and any other “siloed” data streams. The software then identifies the root cause of the faults and provides recommendations based on the most economical fix. Because it is based on information theory and is ‘non-statistical’, it can do this without any hypotheses and even if there is any missing or dirty data. It complements and integrates will all major vendors of process control equipment and can run quietly in the background, checking and recommending root-cause fixes along the way.

SigmaGuardian can be applied across a wide range of manufacturing industries including automotive, electronics, aerospace and pharmaceutical. The technology has already been used to solve issues at global firms including Motorola (provenance of Six Sigma) and is qualified on all major databases such as SAP, Teradata, and Microsoft.

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1 Big data: The next frontier for innovation, competition, and productivity, The McKinsey Global Institute, 2011
2 Manufacturing: Big Data Benefits and Challenges, Tata Consultancy Services, 2013