

Viewpoint: Design for Manufacturing

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About the author: Eujin is the Programme Director for the BSc Product Design and BSc Product Design Engineering programmes at Brunel University London. He was a Research Fellow at leading institutions including Loughborough University, Brunel University and the University of Southampton; and was a Visiting Scientist to Vaal University of Technology and Central University of Technology, Free State His professional design consultancy work includes those for BAE Systems Applied Intelligence, Motorola, Inc., LM Ericsson, Sennheiser GmbH & Co. KG, and Rentokil Initial, of which some products are still manufactured and sold today. He is the Convenor for the International Organisation for Standardisation (ISO) TC261/WG4 group, leading Data Transfer and Design Standards for Additive Manufacturing, as well as holding various positions within ISO committee for Additive Manufacturing standards. Eujin is also a Chartered Technological Product Designer (CTPD) with Institution of Engineering Designers in the UK.

At this time of writing, the latest Purchasing Managers' Index (PMI) data from the Chartered Institute of Purchasing and Supply (CIPS) indicated that the UK Manufacturing has hit a 28-month low. As output, new orders and employment have declined; the UK manufacturing sector fell back into contraction to its lowest level since June 2009. It is a sign of low market confidence and uncertainty. In the report, the most worrying aspect is that new orders have nose-dived most since March 2009 and output is now sustained through a backlog of work. The traditional manufacturing industries that have kept the UK economy buoyant is facing bleak times and the fact that the Eurozone is also in a crisis. Despite these troubled times, the UK Government hopes that precision engineering and high-value manufacturing sector will create jobs and help tackle record youth unemployment.

One such industry is the aviation sector where Design for Manufacturing has been used as a good industry practice so that products can be manufactured more easily without sacrificing safety. Fundamentally, this can be achieved through two principles: reducing the number of assembly operations by part reduction; or by making the assembly operation easier to perform. This has been something of a holy grail to manufacturing industries where part reduction, cutting the use of fasteners and light-weight materials are favourable for cost savings. Recently, the BBC featured an episode on "Making a Super Jumbo Wing" for the Airbus A380 as part of the "How to Build" Series. The wing is the largest ever produced for a commercial aircraft at 17.7 metres from front to back and 36.3 metres from fuselage to wingtip. In the documentary, the manufacturer claims that shaving a thickness of 1 millimetre of material per wing equates to a reduction of 350 kilograms of weight, translating this to significant cost savings for the 238 A380s currently on order. Using the Design for Manufacturing approach has led to a new wing design with greater rigidity, better stability, more accurate aligning and reduced installation times without sacrificing safety. Rolls-Royce is another example of a high value manufacturer and applies the concept of "invent once and use many". For instance, the MT30 turbines that are used to power the

Queen Elizabeth aircraft carriers and other combat ships is based on the same technology as the Trent jet engine and shares a majority of the components.

When Dyson shifted production from Malmesbury to Malaysia in 2002, manufacturing jobs were lost, while research and design jobs remained. Therefore, while the old saying that traditional manufacturing is slowing down is true, it contradicts the new growth of research, design, additive manufacture, precision engineering and high value production. Even more so, greater spin-off effects can be seen such as when British Prime Minister David Cameron opened a new high-tech £400m Airbus factory at Broughton in October and said that the plane maker would safeguard thousands of jobs for many years to come. The factory employs 6000 people at the site with 650 jobs, and is considered as one of the largest manufacturing facilities built in recent years. But will this be enough to give the industry a sustainable future? Probably yes for the next few decades, but when other developing nations play the catch-up game in terms of technology, then we might inevitably need to rethink our manufacturing strategies.