

The Art of Manufacturing

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C o n t e n t s

The Art of Manufacturing supplemental

- Page 3 **In the Beginning**
The growth of manufacturing from early civilisations to the modern age
- Page 7 **What is Manufacturing?**
How populations growth drove mass production in manufacturing
- Page 8 **Good Designs Work**
Examples of good design and products that have become obsolete through advancements in technology and designs that have evolved over time.
- Page 11 **Evolution - Get in Line**
Early beginnings in assembly line manufacturing
- Page 13 **Bauhaus**
How the designs of the Bauhaus movement influenced architecture and products after the First World War
- Page 15 **UK Manufacturing**
Exploring some of the factors behind the growth in productivity and the decline in employment
- Page 19 **Intellectual Property - Cost of loss and theft**
Retaining ownership can be difficult when countries ignore the rules
- Page 20 **Feeling Good**
Examining how manufacturing can put the 'feel good' factor back into Britain
- Page 23 **Making Things**
British innovatoin and industry support for training and the future

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Cover picture:
welters® Precast stone manufacturing

The Art of Manufacturing

The Art of Manufacturing has been produced by Keith Welters to promote and encourage the desire to make manufacturing a prolific career path and enterprise within the UK.



Keith Welters is a leading UK manufacturer

Since the war, there has been a steady decline in manufacturing employment but a continuing rise in manufacturing output. Growth in technological advancement has enabled

greater production using fewer workers who are generally more highly skilled.

The mass employment of workers performing labour-intensive and repetitive tasks has largely been replaced by machines or outsourced to 'offshore resources' such as China and India where manpower, products and components can be cheaply supplied.

Whilst it could be argued that it's 'all built in China now', the UK still maintains its lead as a high-end manufacturer and is the sixth largest manufacturer in the world. The danger lies in these offshore resources 'squaring the circle' by producing highly skilled workers manufacturing high-end products of their own.

It is in fact the initiation and control of the full process that we need to pass on to future generations in order for the UK to continue to maintain and grow its skill base. Outsourcing will be detrimental to the future of our trades if it means using the skills of trained workers elsewhere, leading to the inevitable brain drain as home grown talents are forced to seek opportunities abroad.

This publication highlights the importance of training in trade skills to create the manufacturers of tomorrow.

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Design and Innovation



In the Beginning

Since ancient times manufacturing has formed the basis of all successful civilisations.

The ability to make goods in high volume means a populous can be sustained and trade can be developed both internally and externally which in turn grows the populous and encourages more goods to be imported and exported as the trade routes expand.



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As civilisations developed across northern Europe so too did the fulcrums of manufacturing technology upon which these emerging societies balanced, tipping in favour of some to the disadvantage of others.



If a society could not change and adapt to using new techniques and materials it would soon fall into decline.



If your trade is in manufacturing flint tools then the sight of a bronze axe would be very worrying!

The transition from one age to another has a very blurred edge spreading through cultures and countries at differing rates.

Specific Ages do not appear everywhere at the same time but are generally referred to in archaeological terms as periods of significant changes in the living patterns of a civilisation.

In Europe the end of the Stone Age is marked by the Neolithic, when humans moved from being hunter gatherers and instead built settlements and formed communities to grow crops and domesticate animals for food.



This allowed the development of farming tools and pottery techniques eventually leading to the smelting of copper and bronze alloy in kilns – this move from stone based technology is referred to as the ***Age of Civilisation.***

Empires were created enabled by the successful development and exploitation of the technology of the age allowing them to dominate weaker less developed societies.

An army yielding flint spears are no match for one with forged shields and swords.

Within the rise and fall and evolution of civilisations creativity has always existed and in most cases thrived with design elements so strong they can define specific eras in history.

Greek, Roman, Elizabethan, Victorian are all recognisable as styles of their era and are as distinctive in their clothing or design of furniture as they are in their architecture.



A bowl, pot or cup, a necklace, bangle or brooch, a knife, axe or hammer, a tool, chair or table, items instantly recognisable to Bronze Age man as they are to us; what changes over the years is the way they are manufactured, yet this doesn't necessarily mean a technique employed 3000 years ago becomes redundant, it just means additional techniques evolve enabling a wider choice of manufacturing to take place.

3000 year old objects



Modern day equivalents



The Windsor chair is a good example of how the manufacturing process also became selective, combining hand made elements and machine turned parts to create a single product.



The chair legs and uprights were originally turned on a pole lathe while the seat and backrest were hand crafted.



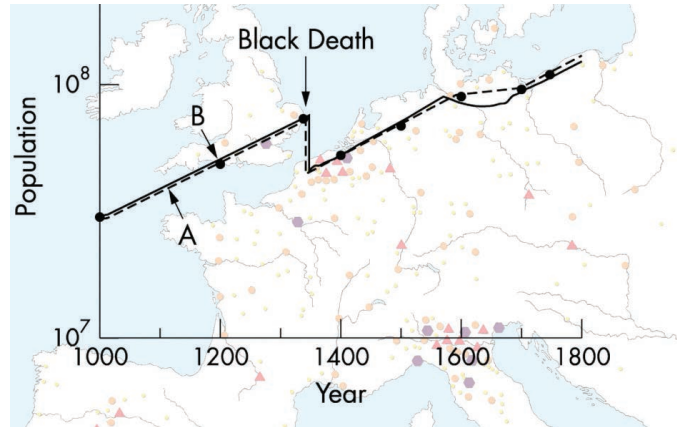
Design and repetitious production working together to create a marriage of Art and Technology which has and will stand the test of time.

If it looks good it probably is.

What is manufacturing?

According to Wikipedia, Manufacturing is:

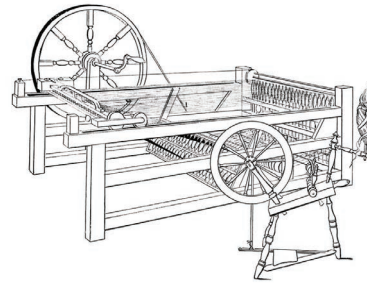
“The production of goods for use or sale using labour and machines, tools, chemical and biological processing, or formulation. The term may refer to a range of human activity, from handicraft to high tech, but is most commonly applied to industrial production, in which raw materials are transformed into finished goods on a large scale.”



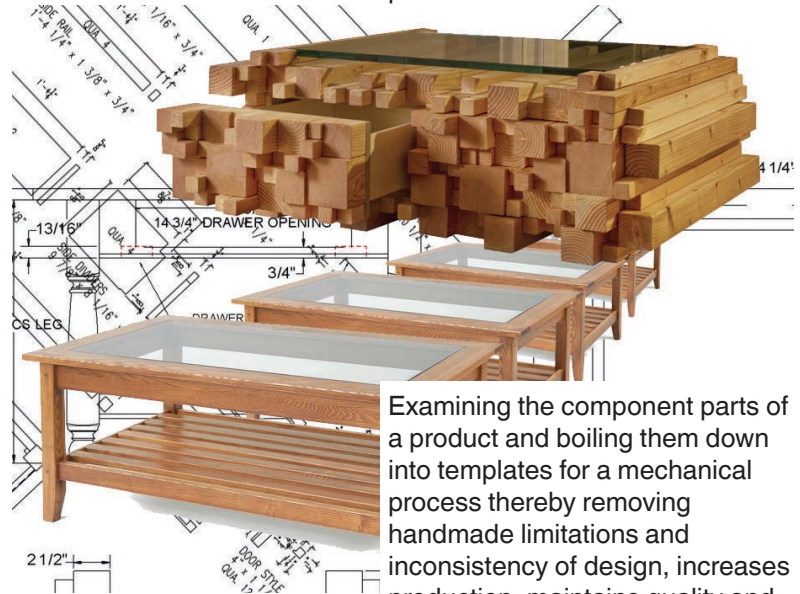
Turn up the Volume

As populations grew so did the competition to provide goods for an ever increasing consumer base that in turn lead to the development of more efficient manufacturing techniques producing higher volume products at lower cost.

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For example, prior to the Industrial Revolution, textiles were primarily made of wool and were hand spun. With the invention of the spinning wheel and the loom, cotton was produced quicker and eventually replaced wool in the textile field. This dramatically reduced production time and the cost to produce material.



Examining the component parts of a product and boiling them down into templates for a mechanical process thereby removing handmade limitations and inconsistency of design, increases production, maintains quality and lowers the cost.

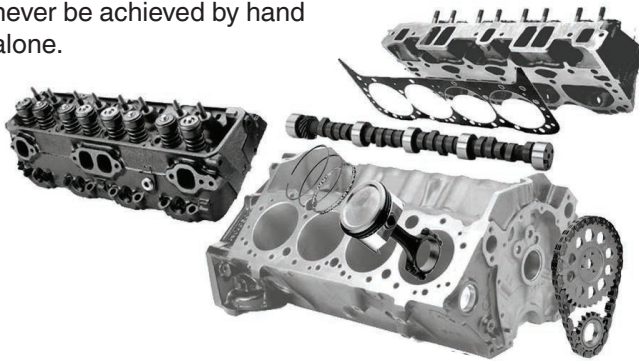
Traditional hand made items can sit equally alongside their mass produced equivalents.

Which one of these items is hand made and which one is flat pack?



Mass producing an item does not necessarily mean a reduction in quality either. Improving and refining the making process to ensure reliable reproduction with no discernable differences

allows a product to be manufactured with a sustainable level of quality and accuracy that could never be achieved by hand alone.



Good designs work

In general, for a product to be successful it must first fulfil a number of criteria.

A combination of all three creates desirability which is a valuable asset when manufacturing a premium product in a competitive market.

A good example of this is the iphone. Technology wise there are more advanced phones on the market but the combination of function, design and style combines to make it one of the most sought-after phones available.

Modern electronics design is constantly evolving driven by the fast-paced development of the technology they support. What seems new and fresh can change within a few years to be old and obsolete. Mobile phones are especially susceptible; the first iphone was released in 2007 and has been superseded five times by subsequent models (iphone 6 at the time of writing).

Function

it must do the job it was designed to do well

Design

the design must aid not hinder the function

Style

the style creates an aesthetic for the design



What was once cutting edge technology can very quickly look very out-dated



Whilst some designs are fleeting and of the moment (and fashion dictates that this is necessary) others are so well conceived that they stay with us with very little adaptation over many years and are instantly recognisable. No prizes for guessing what this image is of...



Robin Day polypropylene stacking chair

Designed in 1962 the chair was one of the first mass produced items to use the injection moulding process.



This deceptively simple design created a low-cost, strong, durable yet lightweight utility chair that can stack safely and easily.

It is made from single formed polypropylene on an enamelled bent tubular steel base.

The chair quickly became the staple chair of choice for schools, offices, canteens, hospitals, airports etc, selling an estimated 50 million units to date.

The design is still in production today and is so iconic it has even appeared on British stamps.



The Fender Stratocaster

Designed in 1954 and manufactured continuously by the Fender Musical Instruments Corporation to the present.



The Fender Stratocaster is one of the most recognisable guitars in the world and also one of the most copied shapes alongside the Gibson Les Paul.

The Gem Paperclip

Introduced in the 1890's the basic design of the gem paperclip hasn't changed in over 100 years.



welters Occasional Chair A120

A comfortable design formed around tubular chrome frame with or without arm rests. This classic design is still available in a variety of different materials.



Evolution

Many designs maintain their original identity but evolve over time, reflecting the modernity of each reincarnation. Classic examples of this are the Mini and the Volkswagen Beetle motor cars.



Although there is very little of the original carried through in respect of component design, and materials; the identity is maintained and the brand is instantly recognisable. This 're-imagining' of well known products can maintain their popularity and connection with the heritage of the original design and also reintroduce them to new users. This is especially prevalent in car manufacturing where a range of styles can be introduced around the same 'classic' model design during the assembly line process.

Get in Line

The principles of assembly line manufacturing and the division of labour to create interchangeable components was not a new concept and has been redeveloped throughout history.



There is evidence that the Terracotta Army, a collection of about 8000 life-sized ceramic soldiers and horses buried with the emperor Qin Shi Huangdi in 209 BC had their separate body parts manufactured by different workshops that were later assembled to completion.



By the end of the 19th Century, manufacturing was beginning to move from mainly hand built products to take the form we think of today. Developments in electricity enabled smaller machines to run much more efficiently than steam powered ones leading to further innovations and progress.



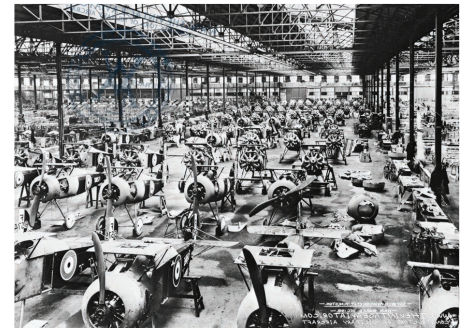
Good designs work

Henry Ford famously developed his assembly line technique for mass production with the Model T motor car during 1908 - 1913.

This form of conveyor belt mass production was designed to optimise the productivity of the assembly worker ensuring each component worked on would be completed and passed down the line as quickly as possible.



The advent of the First World War saw rapid advances in the efficiency of mechanised mass production with huge manufacturing plants working day and night to maintain the war effort.



Bauhaus

It was at this tumultuous time in Germany that a school for art and architecture was founded called Staatliches Bauhaus. The schools proclamation was: "to create a new guild of craftsmen, without the class distinctions which raise an arrogant barrier between craftsman and artist."



Bauhaus focused on utility using clean lines and function to replace the embellishment and ornamentation of the past. The movement became influential in the rebuilding programmes after the end of World War One and proceeded to influence architecture worldwide.



The Bauhaus principals in structural design was encouraged across a range of disciplines. For the first time, architects began designing objects for the home...



...applying their design techniques to domestic items such as furniture, lamps, radios and other household items.

Influences of nature were still drawn upon but used abstractly using less organic shapes.



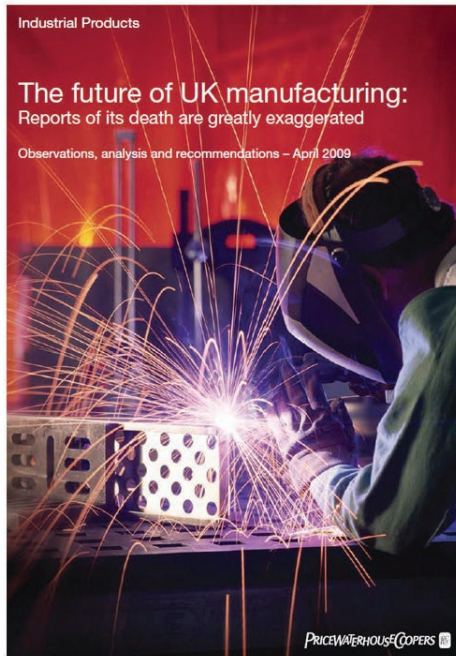
UK Manufacturing

A 2009 report from PricewaterhouseCoopers states: Output of British manufacturing reached an all-time high in 2007, even adjusted for inflation.

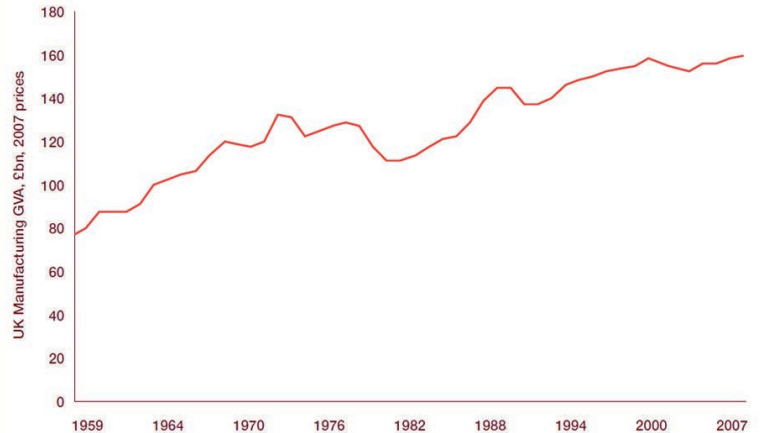
The UK is the world's 6th largest manufacturer with strong positions in certain key industries, e.g. a 15% global market share in Aerospace.

UK Manufacturing achieved a 50% increase in labour productivity from 1997-2007.

The report cites data from the UK Office for National Statistics, stating that UK manufacturing output has increased in 35 out of the past 50 years, and as the graph shows, 2007 was a record year for UK manufacturing production.

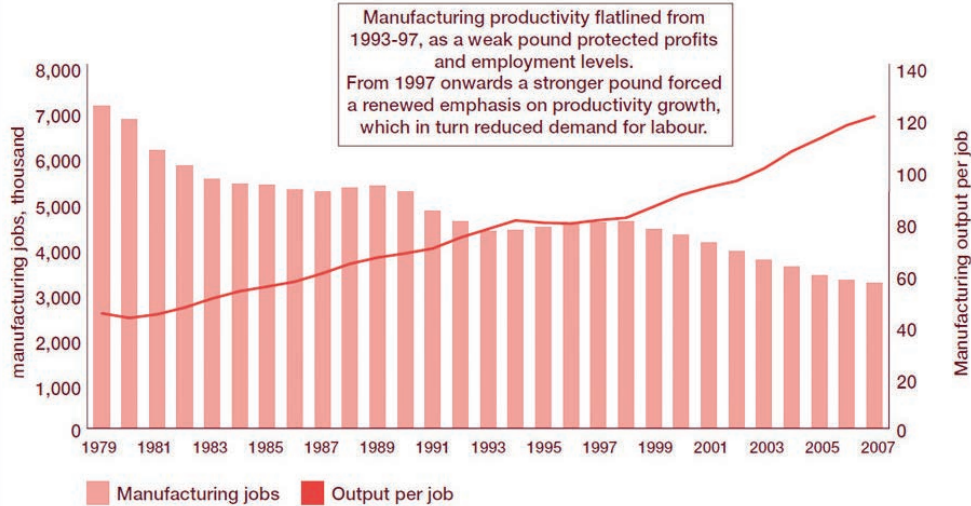


UK Manufacturing output (Gross Value Added), 1958-2007



Source: UK Office for National Statistics

Manufacturing employment and productivity



Source: UK Office for National Statistics

Conversely the number of people employed in manufacturing has dropped steadily as productivity per employee has increased.

This is a trend common in many mature Western economies.

Industries employing thousands of people and producing large volumes of goods (such as car manufacturing) has either become highly efficient, producing the same amount of output from fewer manufacturing sites employing fewer people or has been replaced by smaller industrial units producing high-value goods.



A stark contrast to the heavily populated factories of a few short decades ago.



Gainful Employment

Just as our fields are no longer populated by hoards of labourers tilling by hand it is now no longer the case that our factories are full of people in long term employment.



In the mid 1990's the UK manufacturing sector employed over 4.3m people.

By 2010 that had fallen to under 2.5m – the lowest on record.

The days when whole communities were employed by the local factory are long gone.

Unskilled or labour intensive jobs have largely been either mechanised or outsourced to offshore resources where labour is cheaper.

Outsourcing for cheaper goods and services can make good economic sense.

Using offshore resources to countries such as India and China to tap into workers providing their services at a lower rate of pay than their UK equivalents can be very attractive to companies trying to keep their bottom line down and their competitive edge up.



It is debatable however in the long term whether this approach if unchecked is good for the nation as a whole.

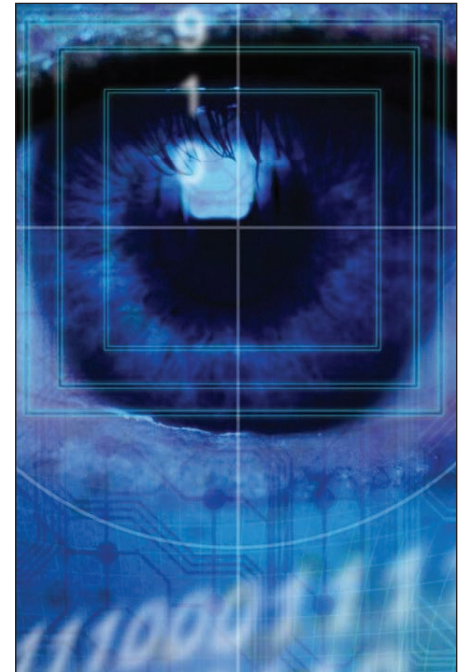
We have already seen huge falls in mass employment in low skilled jobs and as education in the developing countries increase our skilled home based workers are faced with fierce competition from overseas labour.

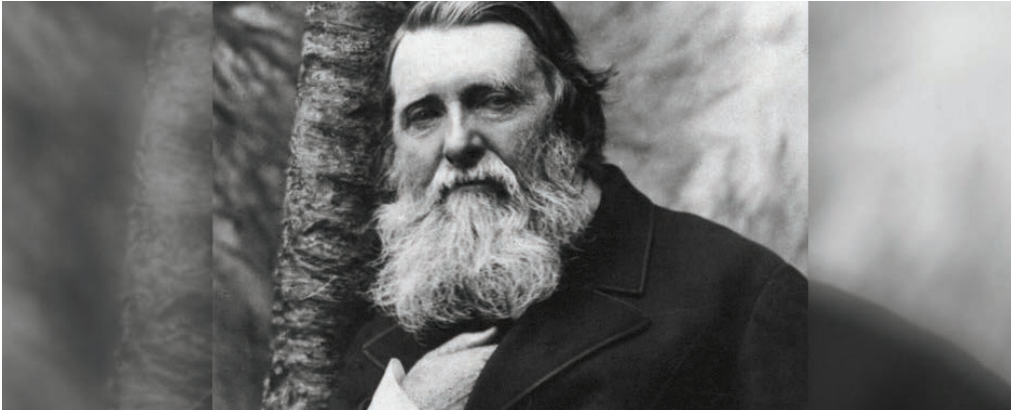


Intellectual property - Cost of loss and theft

Patents protect inventions, ideas and designs from unauthorised use by third parties. However, a patent is only enforceable in the participating country or countries specified within the patent application. Many countries do not enforce or recognise patent protection law and allow the large scale copying of designs and goods to be carried out unabated.

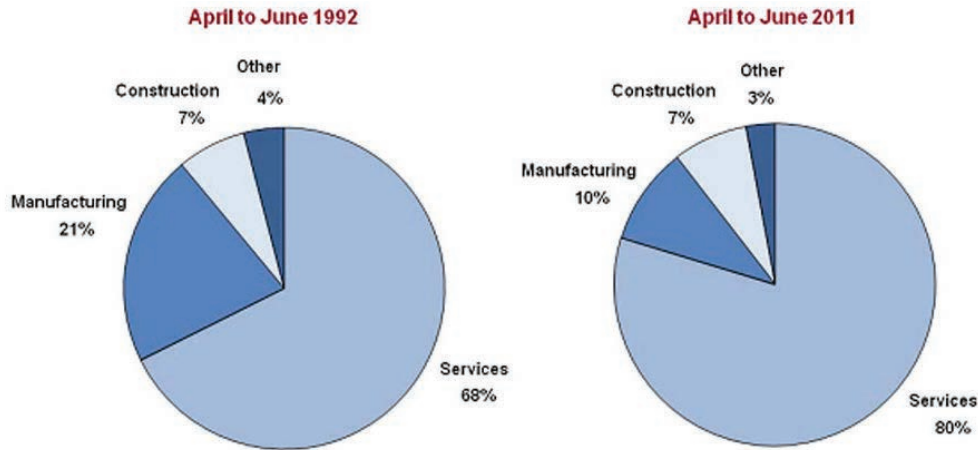
Theft of intellectual property is on the increase and even small companies now have to protect themselves from attack from industrial espionage with cyber crime costing the UK more than £27bn a year.





Feeling Good

John Ruskin, artist, critic and philanthropist said in his essay on economy *Unto This Last*, (1860): "That country is the richest which nourishes the greatest number of noble and happy human beings."



Feel good factor

When the nation was gainfully employed in manufacturing there was a distinct pride in the goods that were made.

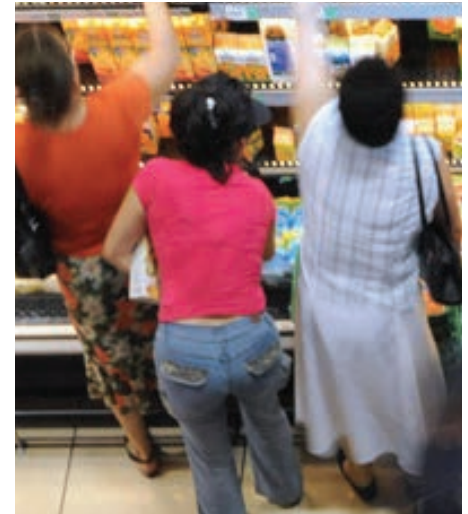
The growth of the service sector over recent years does not imbue this sense of national pride and is seen as somewhat 'soulless'

Imports vs Exports

The UK has a trade deficit if it imports more goods than it exports. In 2011 the trade deficit was over £8 Billion.

To balance this deficit the UK needs to be able to produce goods competitively and of high quality to be attractive to foreign buyers.





Manufacturing is key

If we can increase our exports through manufacturing we can perhaps nurture a sense of pride and happiness in what many feel is now lacking in a consumer driven society.

Art, science and innovation go hand in hand to make Britain great, not as an exercise to drive down cost.

Making things

The art of making things whether in small or large volumes is the practical knowledge of understanding how things work, what they are made of and the relationships between components and knowing their capabilities and their limitations.



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From software to hardware and from widget to sprocket, without this fundamental engineering knowledge and expertise, the UK will be relegated from a leading world innovator, to a country that imports it's products and ideas from outside its borders.

Do we really want to be reliant on other countries for our future prosperity?

The UK has always produced the talent, but if we don't invest firstly in the training of our next generation of engineers and then in the actual manufacturing facilities that will provide the career opportunities to retain those engineers, we will continue to lose them to overseas manufacturing companies who are only too pleased to make full use of their talents.

Our loss is their gain.



We need to grow our manufacturing industry and encourage people to get interested in the art of making things.

Designing for a purpose and producing well made competitive products creates jobs and security for the future.



British Innovation



The label 'Made in Britain' was envied around the world. Various Made in Britain campaigns have been launched to encourage UK businesses over the years but these have been short-lived.

The latest campaign was started in 2011 by cooker manufacturer Stoves in an effort to support and highlight the importance of British manufacturing.

The idea for a logo to identify products made in Britain was conceived by Prescott-based cooker manufacturer Stoves following research that it carried out in 2011 showing that the British public was confused about what products were made in the UK. Stoves launched a competition among students at British universities to design a Made in Britain logo. The chosen design was unveiled in July 2011 and companies making products in the UK were invited to apply to use the logo. By October 2012, 600 companies were using

the logo.

In November 2012 a committee was formed to oversee the marque and assist with the ongoing promotion of the campaign. In June 2013 the committee commissioned design agency The Partners to re-design the logo and establish a membership scheme for users of the logo.

**MADE IN
BRITAIN**



Government Backing?

The irony is the Government cannot be seen to be openly backing a Made in Britain campaign. The Department for Business, Innovation and Skills says the UK relies on open markets and a Buy British campaign would be counter-productive. The reason given is 50% of UK exports go to the EU and a government backed campaign to promote UK goods to UK people could cause 'retaliation' which would ultimately be bad for the economy.



Livery Company Support

If the government is unable to support a campaign then it is up to industry bodies to take the lead.

Through the creation of exciting training courses in the Art of Manufacturing and inspiring all Livery Companies to join in a new campaign to Buy British Made Products we could achieve the kick-start to the economy that the Olympics failed to achieve.



This philosophy is also echoed by a growing number of trade associations such as the British Furniture Manufacturers (BFM) which is a trade association, employers' organisation and member of the European Furniture Manufacturers' Association.

BFM has been representing the interests of the furniture industry for more than 60 years, safeguarding members interests and promoting their standards and competitiveness, both nationally and internationally.



