

Supply Chains in Practice Networking Event

The Return to Localised Manufacturing:
Business Challenges and Opportunities

10th March 2015



Explore from 3 perspectives...

1. Changing landscape Jan
2. Technology perspective Len
3. Legal Perspective Cerys

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The Changing Landscape

Jan Godsell

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Barrie Knitwear, Harwick...



"The acquisition of Barrie by Chanel is all the more natural as the factory has worked with us for more than 25 years, producing cashmere knitwear including Chanel's iconic two-tone cashmere cardigans. Through this acquisition, we reaffirm our commitment to traditional expertise and craftsmanship."

October, 2012

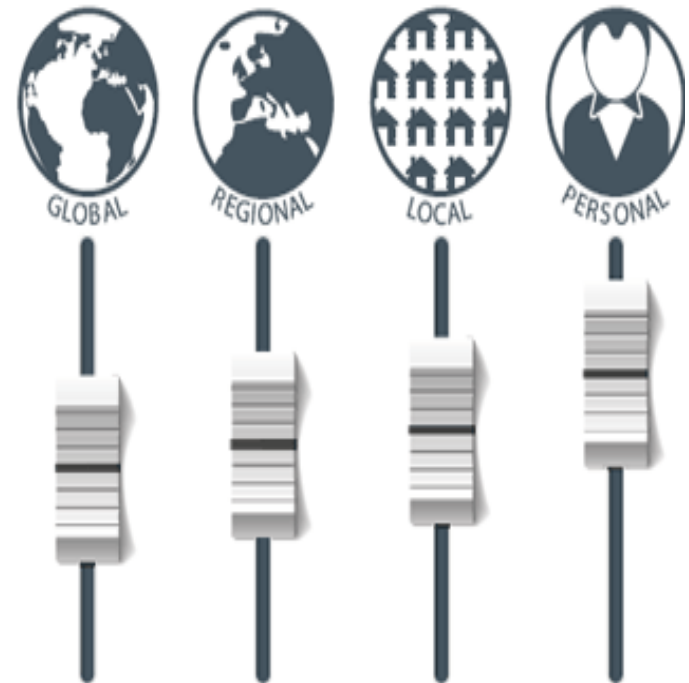
3 Drivers...

1. Right-shoring
2. Mass-personalisation
3. Risk and resilience












From off-shoring to re-shoring to right-shoring...

Right-shoring is the placement of a business' components and processes in localities and countries that provide the best combination of cost and efficiency. Right-shoring does not require a company to move business processes overseas. Rather, it is a strategy in which a business analyzes the complexity and importance of required tasks and entrusts their completion with the most suitable workforce, regardless of location













Source: <http://www.investopedia.com/terms/r/right-shoring.asp>

A total SC cost perspective can favour regional or local manufacture...

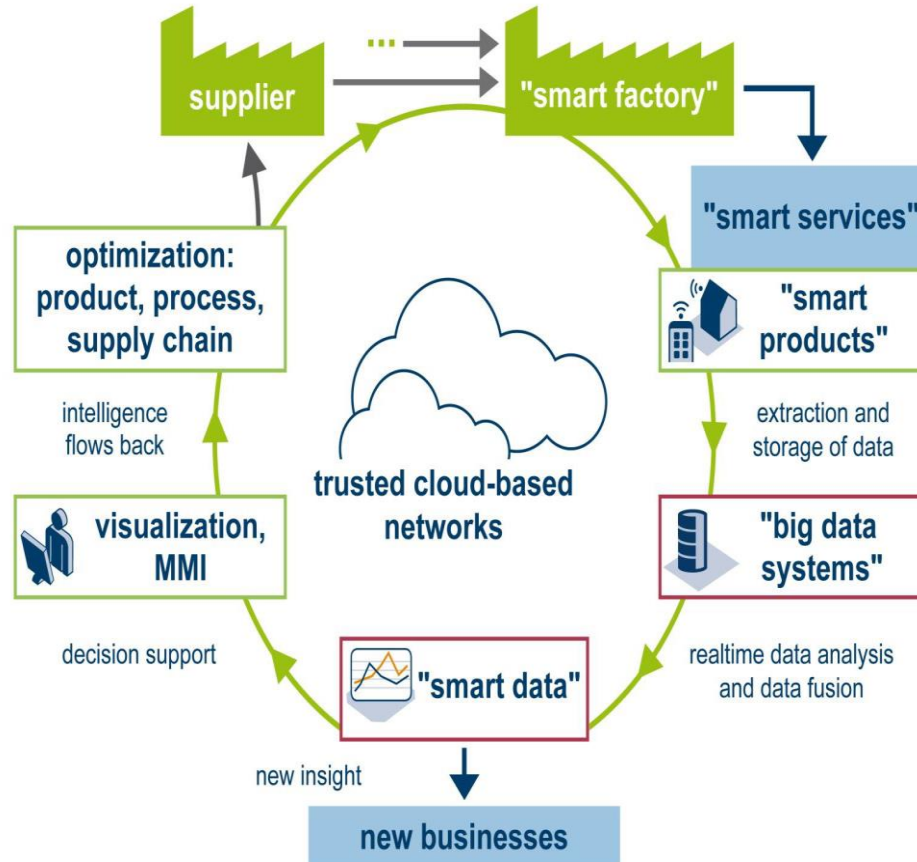
PRODUCT UNIT COST	 CHINA	 MALAYSIA	 INDONESIA	 MEXICO	 HUNGARY	 UKRAINE
 Smartphone	\$149.60	\$150.64 (+0.7%)	\$152.94 (+0.9%)	\$151.40 (+1.2%)	\$153.80 (+2.8%)	\$ 148.4 (-0.8%)
 Infrastructure	\$20,493	\$21,005 (+2.5%)	\$20,902 (+2.00%)	\$20,546 (+0.2%)	\$20,340 (-0.1%)	\$20,083 (-2.0%)
 Printer	\$79.50	\$80.48 (+1.24%)	\$80.48 (+1.24%)	\$80.30 (+1.1%)	\$80.69 (+1.5%)	\$78.3 (-1.5%)
 Desktop PC	\$421.60	\$427.90 (+1.5%)	\$427.90 (+1.5%)	\$421.60 (0%)	\$423.70 (0.5%)	\$413.16 (-2.0%)

Regional or local manufacturing can lower inventory holding costs

PRODUCT UNIT COST	 CHINA	 MALAYSIA	 INDONESIA	 MEXICO	 HUNGARY	 UKRAINE
~COGS \$150  Smartphone	\$1.56	\$1.48 (-5.3%)	\$1.56 (0.0%)	\$0.49 (-68.4%)	\$0.50 (-68.4%)	\$1.2 (-23%)
\$20K  Infrastructure	\$383.5	\$350.0 (-8.6%)	\$383.5 (0.0%)	\$109.5 (-71.4%)	\$110.0 (-71.4%)	\$153.4 (-60%)
\$80  Printer	\$1.53	\$1.40 (-8.6%)	\$1.53 (0.0%)	\$0.44 (-71.4%)	\$0.45 (-71.4%)	\$0.6 (-60%)
\$420  Desktop PC	\$9.67	\$8.98 (-7.1%)	\$9.67 (0.0%)	\$2.30 (-76.2%)	\$2.4 (-76.2%)	\$3.2 (-65%)

Up to 60-70% lower!

The internet is driving the next generation of business models...

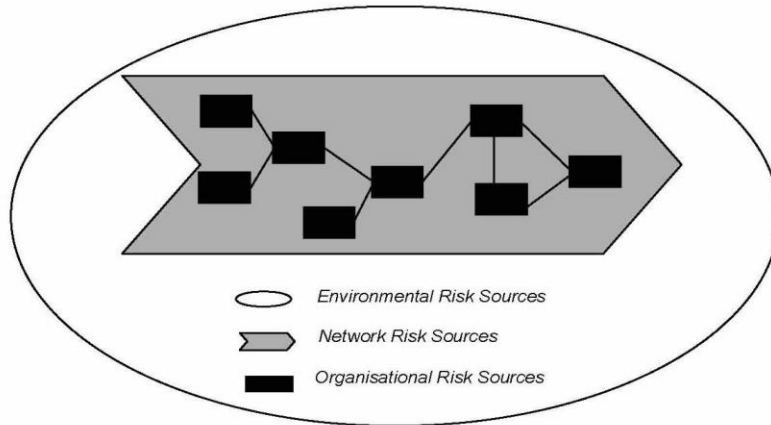


Enabled by a more contemporary approach to the supply chain...

	Traditional supply chain	Contemporary supply chain
Driver	Cost	Customer
Cost orientation	Manufacturing cost	Total landed cost
Batch size	Large	Of one
Manufacturing location	Global	Local
Social and environmental sustainability	Low visibility	High visibility
Customer quality	Limited to conformance of product to quality standards	Superior quality delivered through fully personalised products

‘personalisation at mass-production prices’

70% of SC glitches are a result of a network risks...



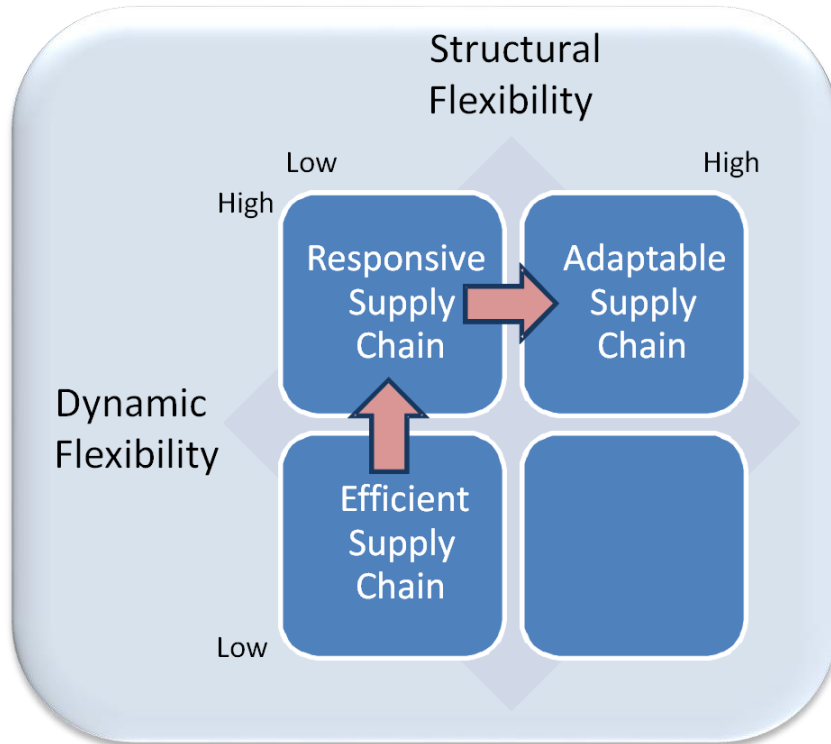
Environmental risks are uncertainties that arise from supply chain interaction with the environment e.g. accidents, political incidents, 'acts of god'

Organisational risks are found with the organisation e.g. uncertainties regarding production, labour or IT

Network risks are supply risks that are inherent due to interaction with supply chain partners e.g. failure to supply



Strive to achieve dynamic and structural flexibility across the SC



Dynamic flexibility is a reflection of the agility of the supply chain, particularly its ability to respond rapidly to variations in volume and mix.

Structural flexibility is the ability of the supply chain to adapt to fundamental change, e.g. if the 'centre of gravity' of the supply chain changes, can the system change?

Structural flexibility challenges current supply chain strategic thinking

Challenge	Approach
Local vs. Global sourcing	Investigate 'local-for-local' alternative to global sourcing and centralised manufacturing
Economies of Scope vs. Scale	Focus on the 'economies of scope' rather than the 'economies of scale'
Wide vs. Narrow bandwidth	Create 'bandwidth' through asset sharing, e.g. capacity and inventory
Multiple vs. Single options	Adopt a 'real options' approach to supply chain decision making

3 Drivers...

1. Right-shoring
2. Mass-personalisation
3. Risk, resilience & structural flexibility



VISAGIO



Business and Supply Chain Implications of 3D Printing

Len Pannett

VISAGIO

Local manufacture has many driving questions...

You need to get a critical, customised part the same day that you need it for an urgent warranty repair

You need to replace a part that hasn't been manufactured for 25 years

You have to reduce your inventory to what you need for the day

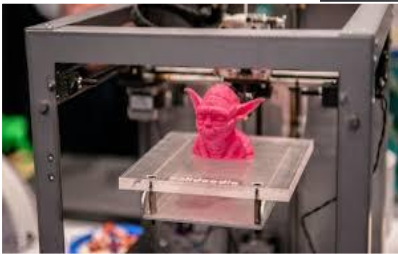
You want to avoid the cost of carrying expensive, slow-moving after sales inventory items

You don't want to have to wait months for parts to clear customs

You want to test what the market thinks of your new design without a large investment

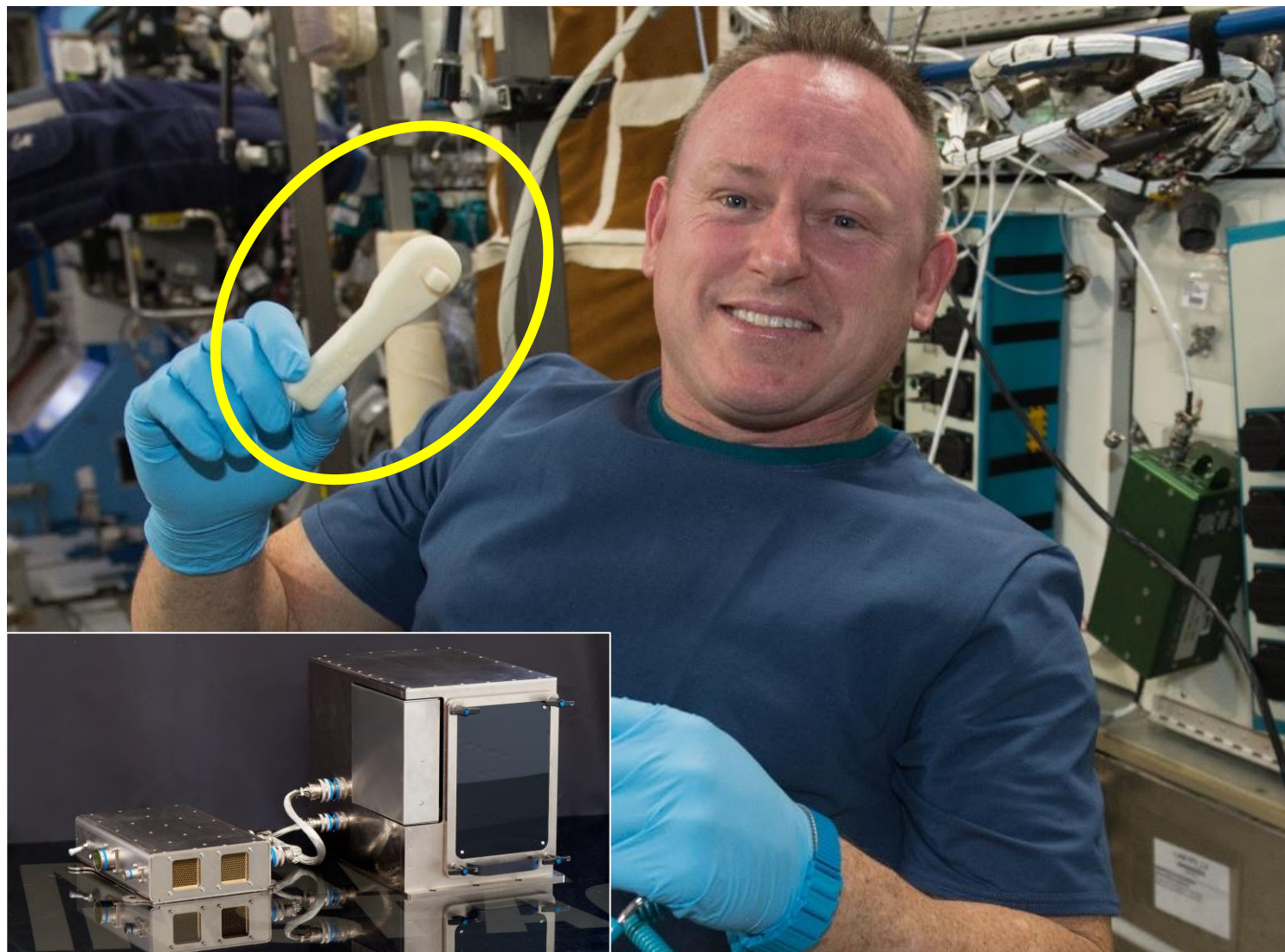


...and 3D printing is the answer to many

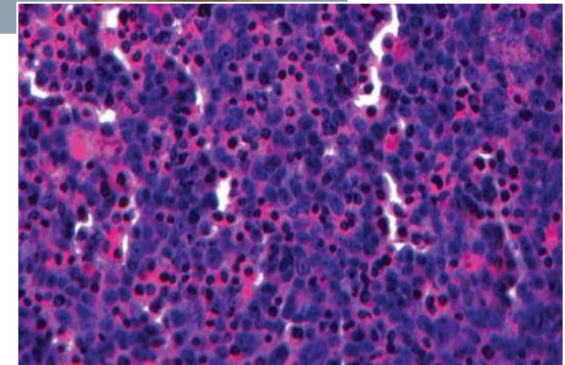




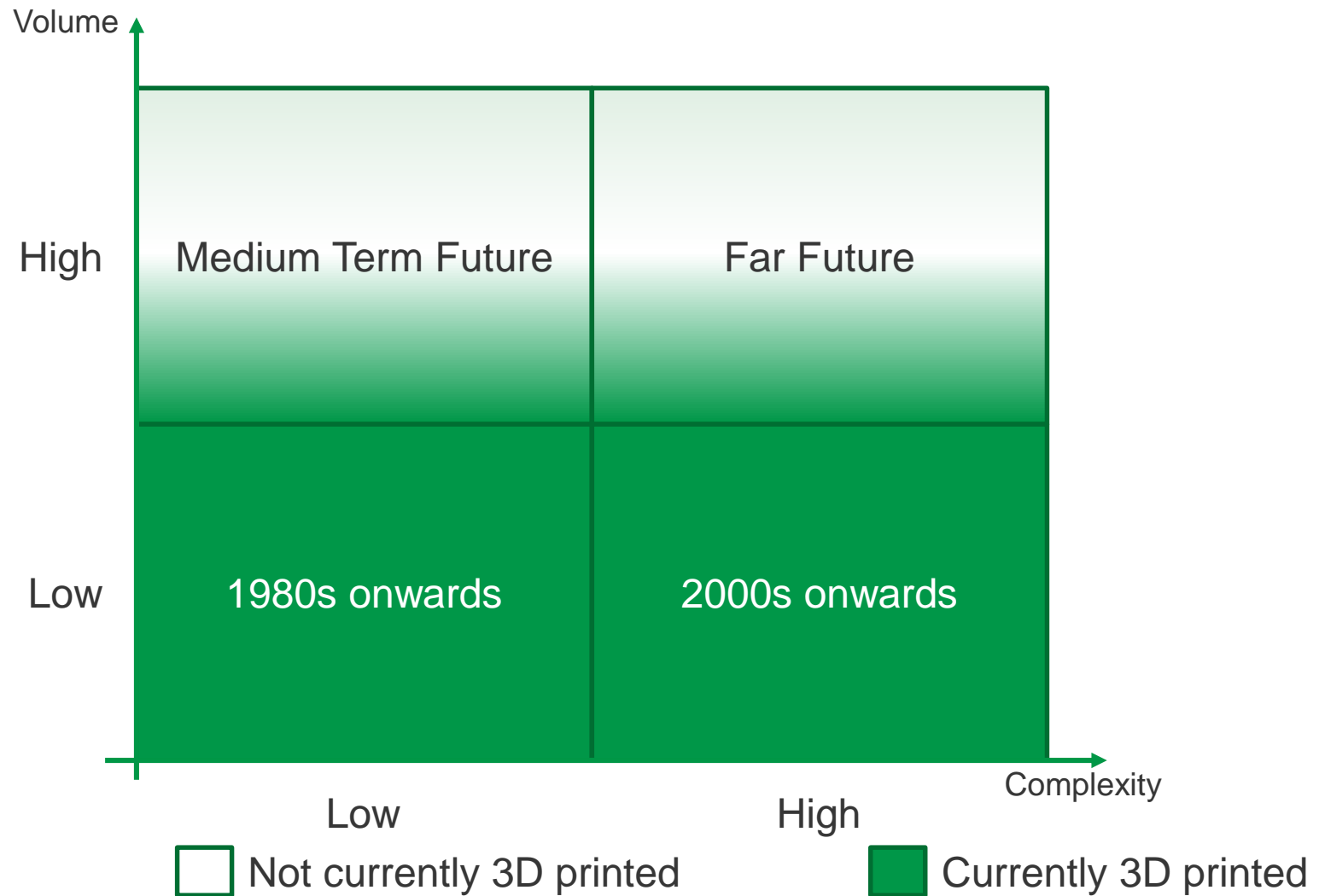
ISS Expedition 42 Commander Barry "Butch" Wilmore Using a "Made in Space" 3D Printer



Several industries now use 3D printing for development and manufacture



Volume vs Complexity – Development through time



Next stages of supply chain maturity

■ = 3D Printer

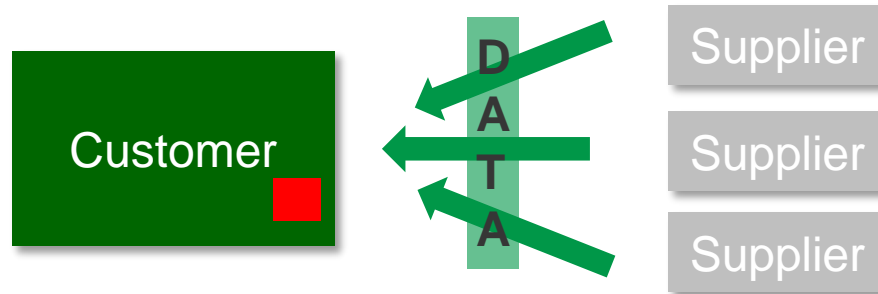
Inventory reduction



Customer-located manufacturing



Customer Managed Inventory (CMI)



3D Print Centre



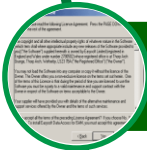
3D Printing brings many other considerations that also need to be resolved



Transformed testing and QA



IP protection of product and parts



New charging models



Liability for customer-printed products



Regulation and accreditation

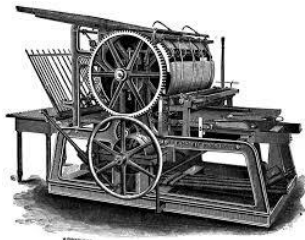


Reduced cross-border tariffs tax revenues

New technologies have a history of leading to more being done locally



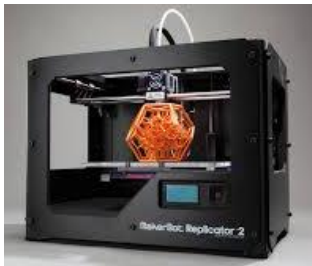
Home Photography



Home Publishing



App Authoring



*Localised
Manufacture*





Thank You

VISAGIO

Legal Implications of 3D Printing and Localised Manufacturing

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Pinsent Masons

3D Printing - Intellectual Property Challenges

- 3D printing makes copying of objects very easy - CAD blue prints easy to copy and distribute on internet
- Copying made easier by availability of low cost 3D scanners – anyone can scan off the shelf products
- All that is needed to reproduce a product is a printer, software, raw materials and a design!
- Cost of 3D printers decreasing steadily due to the expiry of patents on the printers themselves

3D Printing - Intellectual Property Challenges

- Global scale of manufacturing sector makes stakes even higher
- Ease with which counterfeit products can be “printed” makes intellectual property and their owners’ competitive position very vulnerable
- Designers, owners of IPRs and those printing need to be aware of way IPRs *created, protected and infringed* (and remedies available)

Copyright

- Copyright protects :
 - Original literary, artistic, musical and dramatic works
 - Protects the images and designs printed on surface of products
 - Protects the software used to operate the printers and to create the CAD designs
 - Protects the blueprints used to create 3D products
 - Protects some 3D works e.g. sculptures and works of artistic craftsmanship
 - Can protect data and databases
- But : The Star Wars Storm Trooper helmet and a model for a dental tray were held not to be protectable.
- Artistic Craftsmanship – high threshold – not include a prototype for a sofa but likely to include for example pottery and handcrafted jewellery
- Does not protect design of functional objects

Copyright - Infringement

- Infringement
 - Protects against copying, distribution of or adaptation of the material
 - Must have copied and made substantial reproduction
 - Qualitative not quantitative test
 - Intention not relevant
 - Copies of copies
- Third Party Printing service – if without licence copies a copyright work and/or provides copies to public – amounts to infringement
- Knowledge of infringement and intention irrelevant for acts of primary infringement
- New exception for private copying – where individual already owns a lawful copy – can make copy for own personal use



UK Registered Designs

- Protects shape and configuration of products
- Protects appearance of whole or part of a product resulting from the features of in particular the lines contours shape texture or materials of the product or its ornamentation
- Certain exclusions apply (e.g. if dictated by function)
- Protection for up to 25 years – five yearly renewal fees
- Monopoly right - infringement arises by reproducing design whether or not copied, includes making product in which design incorporated
- NB: Also European registered designs

UK Unregistered Design Rights

- Protects shape and configuration of products – internal or external features and whole or part of article
- Typically not sufficient artistic merit to be protected by copyright
- Protects original design – not original if common place in the design field in question at the time of creation
- Arises automatically so long as design original – no registration - must be recorded in design document or article made to design
- Infringement by copying only – exactly or substantially
- NB: Also European unregistered designs

Designs and 3D Printing

- Designs are the right most readily found in everyday objects – key right to challenge 3D printing
- Commercial reproduction of products/objects by 3D printing could well amount to design right infringement
- Intention and knowledge that actions infringe not relevant
- No infringement if act done privately for non-commercial purposes e.g. copied by individual in own home for own personal use? But if then sells the printed items this is infringement

Designs and 3D Printing

- Spare parts – position less favourable to rights owners even where printed for commercial purposes
- Design features enabling one product to be functionally fitted or aesthetically matched to another are specifically excluded from protection
- Not infringement for third party to copy any features of protected design that enables own design to be connected to or matched with protected design

Patents

- Patents can protect complex inventions but also some simple products that can be produced by 3D printing e.g. specialist tubing for use in ventilators
- Replacement parts are particularly susceptible to production by 3D printing – they may themselves be protected or when combined with other parts form part of a patented product
- Replacement of a part of a patented product in some instances may amount to “repair” and not infringement
- Infringement by selling, importing, using, offering for disposal or disposing of and even keeping the infringing product

UK and Community Trade Marks and 3D Printing

- Right to stop others using identical sign (or similar) in relation to identical (or similar) goods or services
- Where a trade mark or logo appears on products/objects which are then copied risk infringement
- Trade marks can also be registered for shape of products – although difficult to obtain
- Commercial 3D printing service would be using trade mark in course of trade when reproduce trade mark on printed product/object
- Private printing of objects which includes registered trade mark will not amount to “use in course of trade” unless sell the product/object
- Intention and knowledge of infringement irrelevant

Manufacture and Supply of 3D Printers

- Can manufacture and supply of 3D Printers amount to authorisation of infringement?
- Unlikely to be held to amount to authorisation
- *CBS Songs Limited v Amstrad Consumer Electronics plc [1988]* – House of Lords rejected argument that supplying twin-deck tape recorders likely to be used for infringing purposes constituted authorisation
- Advertising made it clear it could not grant permission to copy protected works and had no control over use
- Provided 3D printers have warnings like these unlikely to be liable for authorising copyright infringement but watch this space.....

Product Liability

- Product liability predicted to be other most substantial risk:
 - Defective original product
 - Defective original digital design
 - Defective digital file
 - Corrupted copy of a model digital file
 - Defective 3D printer
 - Defective printing material in 3D printer
 - Human error in implementing the digital design
 - Human error in using the 3D printer and/or materials

Product Liability

- More pirated products likely to mean higher risk of defective products
- Risks of bodily injury, death and/or property damage claims
- Manufacturers could face litigation and product recalls for finished products or component products which they have not manufactured
- Tracing product and proving liability key
- Should manufacturers of 3D printers be liable?
- Liability likely to be established on a case by case basis
- Current product liability laws and regulations may not be suitable
- Insurance?

Challenges for Change?

- IPRs are granted to encourage and reward innovation
- Innovation in 3D printing not just about replication – about taking ideas/designs and modifying and making better
- 3D printing makes it easier for anyone to be part of the manufacturing process and test and evolve their ideas
- Platform for collaboration to accelerate innovation –c.f. the internet!
- Do IPR laws need to be changed?
- Do current product liability laws and regulations need to be reviewed and amended?

Supply Chain Model Disruption

- Digitisation forced change within recording and other creative industries and fuelled tension around existing IP laws e.g. Napster
- Likely to be similar debates and wars likely to emerge from 3D Printing
- 2013 Nokia announced making 3D printable files of its Lumia 820 phone case available to customers so can create own designs and print on any 3D printer
- Lego might consider 3D printing of its toy bricks with vision of people printing them at home
- Requires significant adaptation in mind set and business models/licensing schemes
- Licenses of IPR – revenue?
- Collaborative or circular models?
- Different contract structure and terms required



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Roundtable discussion

And continue the debate via Twitter:

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Traditional vs 3D Printed Supply Chain

Traditional Supply Chain

Batches of 100s, 1000s+

Manufactured goods are 'pushed out'

Distributed through warehouse network to customers

Long lead time

High transport costs

Large carbon footprint

Vs

3D Printing Supply Chain

Batches of one

'Pulled' by end customer demand

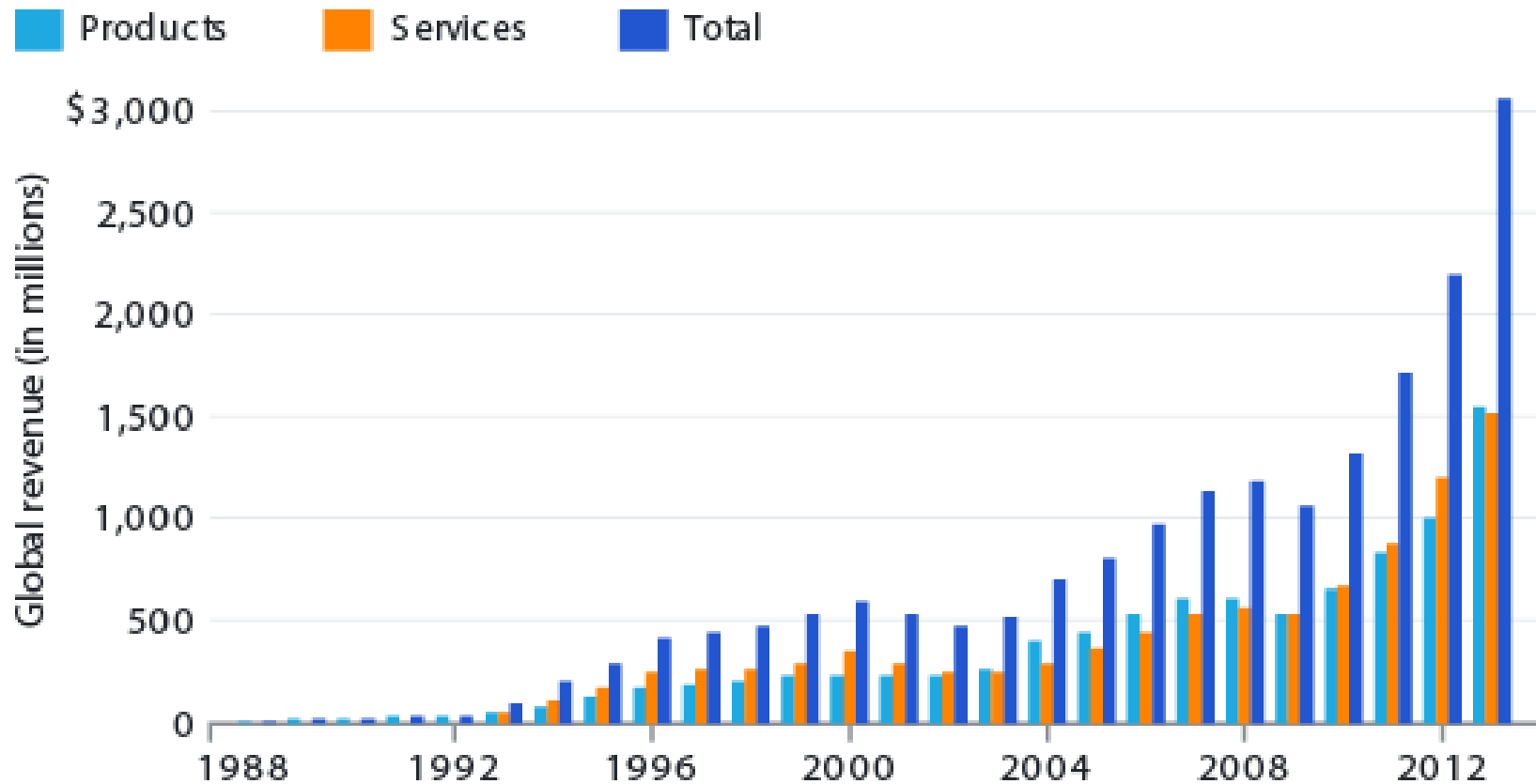
Locally printed and distributed

Short lead time

Low transport costs





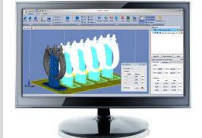


Low carbon footprint

The uptake of 3D Printing is growing exponentially



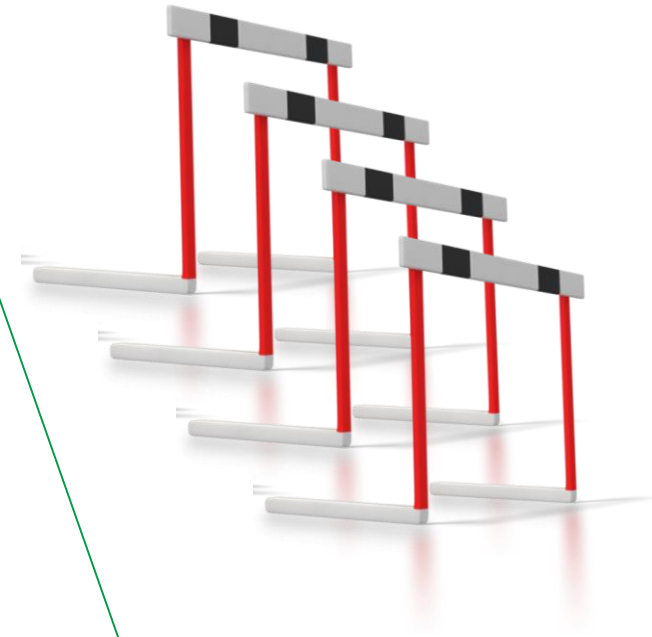
Source: Wolhers Report

So why all of the attention now?

Range of materials that can be 3D printed	↑	
Number of materials that can be 3D printed in same product	↑	
Number of colours that can be 3D printed at same time	↑	
Accuracy and precision of scanning technologies	↑	
User-friendliness of software tools	↑	
Competition in hardware and software space	↑	
Prices of hardware and raw materials	↓	

Promising, although not without hurdles

- Expiring patents
- Number of materials is restricted
- Printing speeds are slow
- High costs of raw materials
- Material strengths are questionable
- Finishing is very rough
- Designing products is a skilled art
- Concerns about health hazards
- Printing quality is highly variable



But these are improving!

Retail and Industrial Uses



Each 3D printed duck was sold for HK\$488 (c£42), with a "dim sum steamer", a nameplate and birth certificate.

Rolls-Royce is making its largest pieces ever, a 150cm diameter, 50cm thick bearing for one its XWB engines which houses 48 titanium aerofoils using the technique.

