

The impacts of 3D printing implementation on business performance: Moderation effect of knowledge management competences

Di Li, Birmingham City University, Di.Li@bcu.ac.uk

Ruoqi Geng, Cardiff University, GengR@cardiff.ac.uk

John Bancroft, Oxford Brookes University, jbankroft@brookes.ac.uk

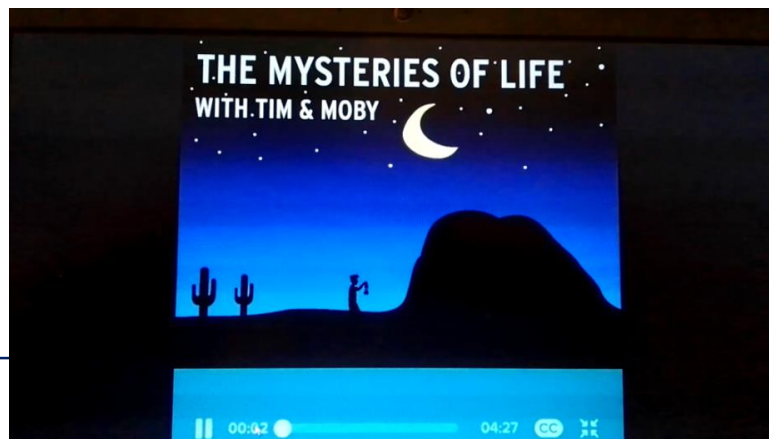
Zuoxin Zhou, Nottingham University, Zuoxin.Zhou@nottingham.ac.uk



What is 3D Printing?

- 3D Printing: Additive Manufacturing

The 3D printing technology is based on layer-by-layer fabrication replicating the product design on computer.



CITY

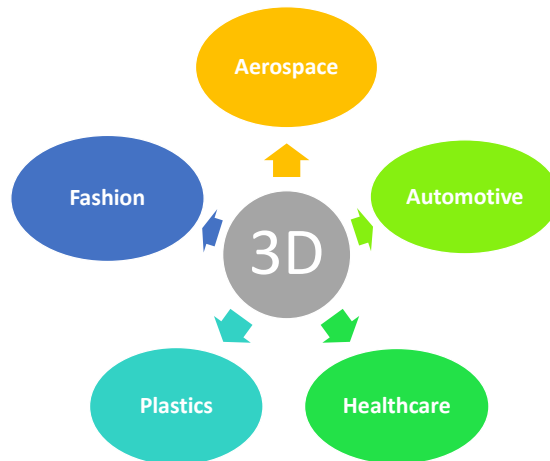
What is 3D Printing?

- 3D Printing: Additive Manufacturing

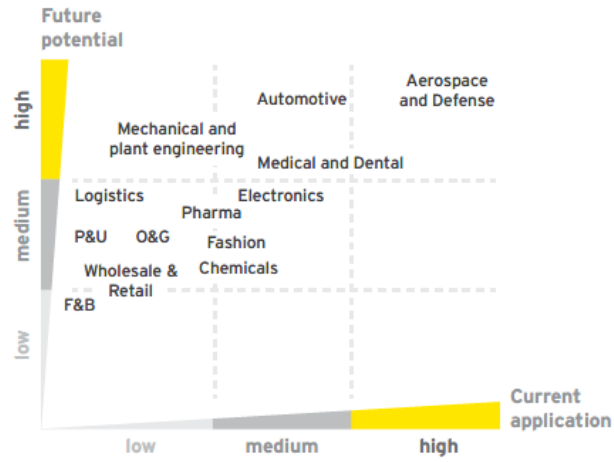
The 3D printing technology is based on layer-by-layer fabrication replicating the product design on computer.



3D Printing Implementation



3D Printing Implementation

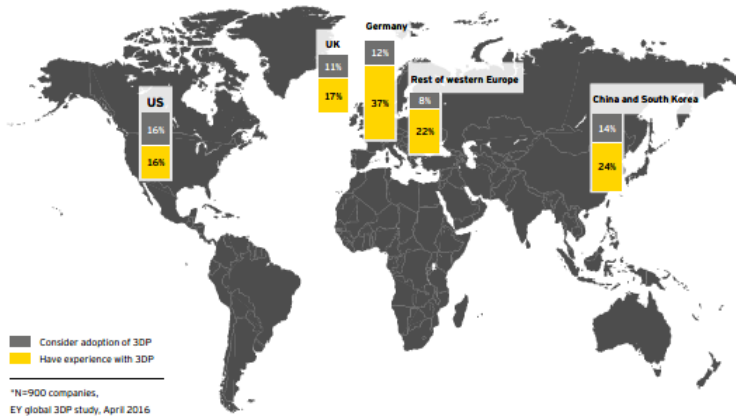


Source: EY analysis based on 2016 EY global 3D printing survey.



3D Printing Status

Current and intended acceptance of 3DP among countries (%)

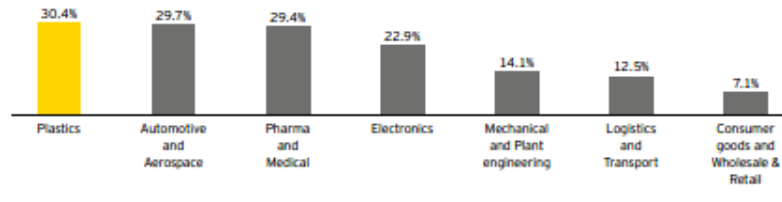


3D Printing Status

- Additive manufacturing beyond prototyping technology

Chart 4

Around one third of the plastics, automotive and aerospace, and pharmaceutical and medical companies that use 3D printing apply it for printing their own end components or products (%)*



*N=214 companies, EY global 3DP study, April 2016

3D Printing Benefits – Supply Chain



16 PARTS AND ASSEMBLY



1 PART, NO ASSEMBLY

Figure 11: Reduced product complexity through 3-D printing for aircraft air duct. Source: 3-D Systems (2013)

- [Reduce Leadtime](#)
- Sustainable
- Customization
- Freedom of Design
- Complex product
- Vertical Integration 2.0
- Manufacturing Visibility
- [Simpler SC Network](#)

Adidas starts to produce 3D printed shoes



- Adidas on October 7, 2015 unveiled the future of performance footwear with Futurecraft 3D. Adidas has partnered with Materialise, a pioneer and leading specialist in 3D printing, for its Futurecraft initiative.
- Creating a flexible, fully breathable carbon copy of the athlete's own footprint, matching exact contours and pressure points, it will set the athlete up for the best running experience. Linked with existing data sourcing and footscan technologies, it opens unique opportunities for immediate in-store fittings.

Adidas benefit ...



Lead-time of updating colour reduces from 6months to 1month after using 3D printing design.

Adidas Net income grows 38% to € 350 million!

Additive manufacturing could reduce energy use by **50 percent** and reduces material costs by up to **90 percent** compared to traditional manufacturing.

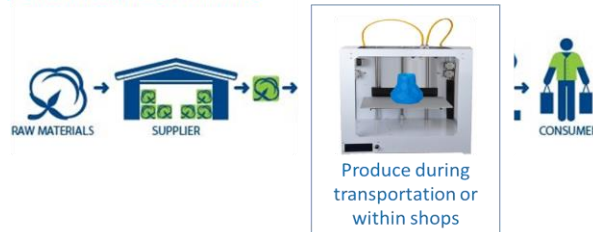


Compact Supply Chain Network

- Supply Chain (Traditional)



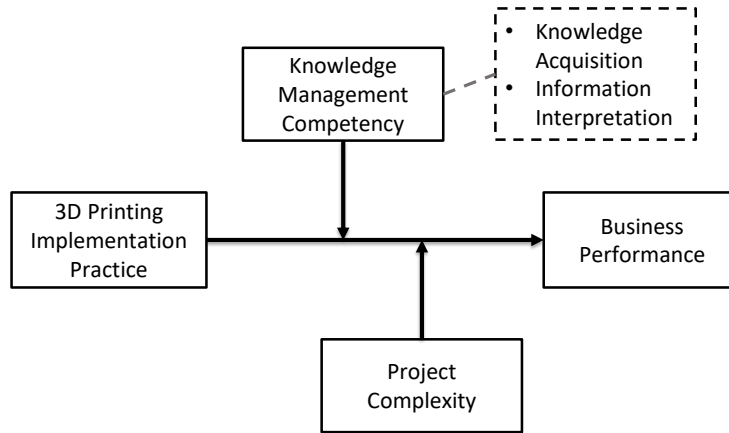
- Supply Chain (Future 3D Printing)



Research Gaps

- Early stage of the research of 3D implementation in industries, limited publications
- Modelling method, no empirical work
- Drivers of 3D investment
- Impacts of 3D implementation

Theoretical Model



Measurement Items

Variables	Measurement Items	References
3D Printing Implementation Practices	Opt1: Yes/No	
	Opt2: Percentage of 3D printed activities account total manufacturing activities of the product.	
Business Performance	Return on sales (ROS)	(Cao and Zhang 2011; Chi et al. 2009; Chang and King, 2005; Cleveland, Schroeder and Anderson 1989; Droge, Vickery and Markland 1994; Liu et al. 2016; Morash et al. 1996; Vickery et al. 1999)
	ROS growth	
	Market Share	
	Market share growth	
	Return on investment (ROI)	
	ROI growth	
Knowledge Acquisition	Pre-tax return on assets (ROA)	
	'Proficient' is a good description for the process of information acquisition engaged in during the development of the product.	(Brockman and Morgan, 2003)
	The development project team for this product was efficient at acquiring information.	
	We displayed a high level of competence in acquiring the information needed to develop the product.	
The process of information acquisition engaged in during the development of the product was productive.		
Information Interpretation	Everyone working on the project shared a similar understanding of the role the acquired information would play in developing the new product.	(Brockman and Morgan, 2003)
	There was a general agreement among project members regarding how acquired information would be used for the new product's development.	
	Everyone had the same intent for how the acquired information would be used in developing the new product.	
Project Complexity	Everyone working on the project shared a similar understanding of the role the acquired information would play in developing the new product	(Tatikonda and Rosenthal, 2000)
	the product modules	
	the product configuration	
	the product technologies in this project	
	the individual manufacturing stages	
the process layout		
	the manufacturing technologies in this project	

Data Collection

- Combination of Primary and Secondary Data source
- Survey: Qualtrics
- Bloomberg: Survey or Business Performance



Thank You!

Q&A

