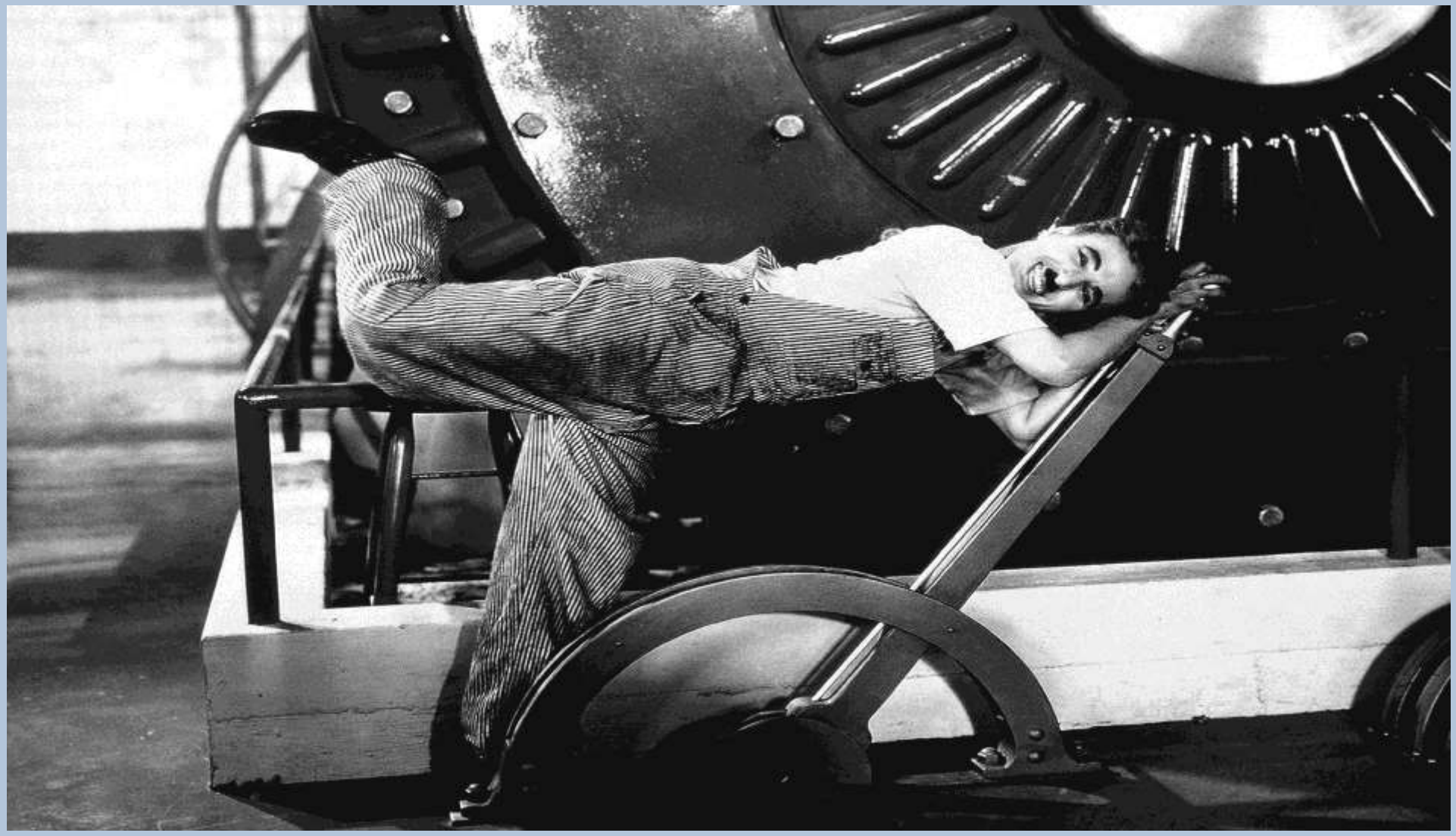
The New Industrial Revolution:
Opportunities for Britain and the World

Cranfield University, Feb 18 2014

Address by Peter Marsh
Author, “The New Industrial Revolution”
Petermarsh307@gmail.com

After the economic crisis...

What's the future for manufacturing?



Some optimistic views

“There’s a new zeitgeist: I’m seeing a global manufacturing renaissance” :
Jeff Immelt, chief executive, General Electric, April 2012.

China a big part of the picture

A mix of skills and capabilities

But production jobs becoming scarcer

Where are the people ?

EU manufacturing employment dropped 11 per cent between 2008 & 2012 (net loss 4.3m jobs)

The new industrial revolution

- What manufacturing means
- Global trends – where Britain fits in
- The 5th industrial revolution
- Business strategies

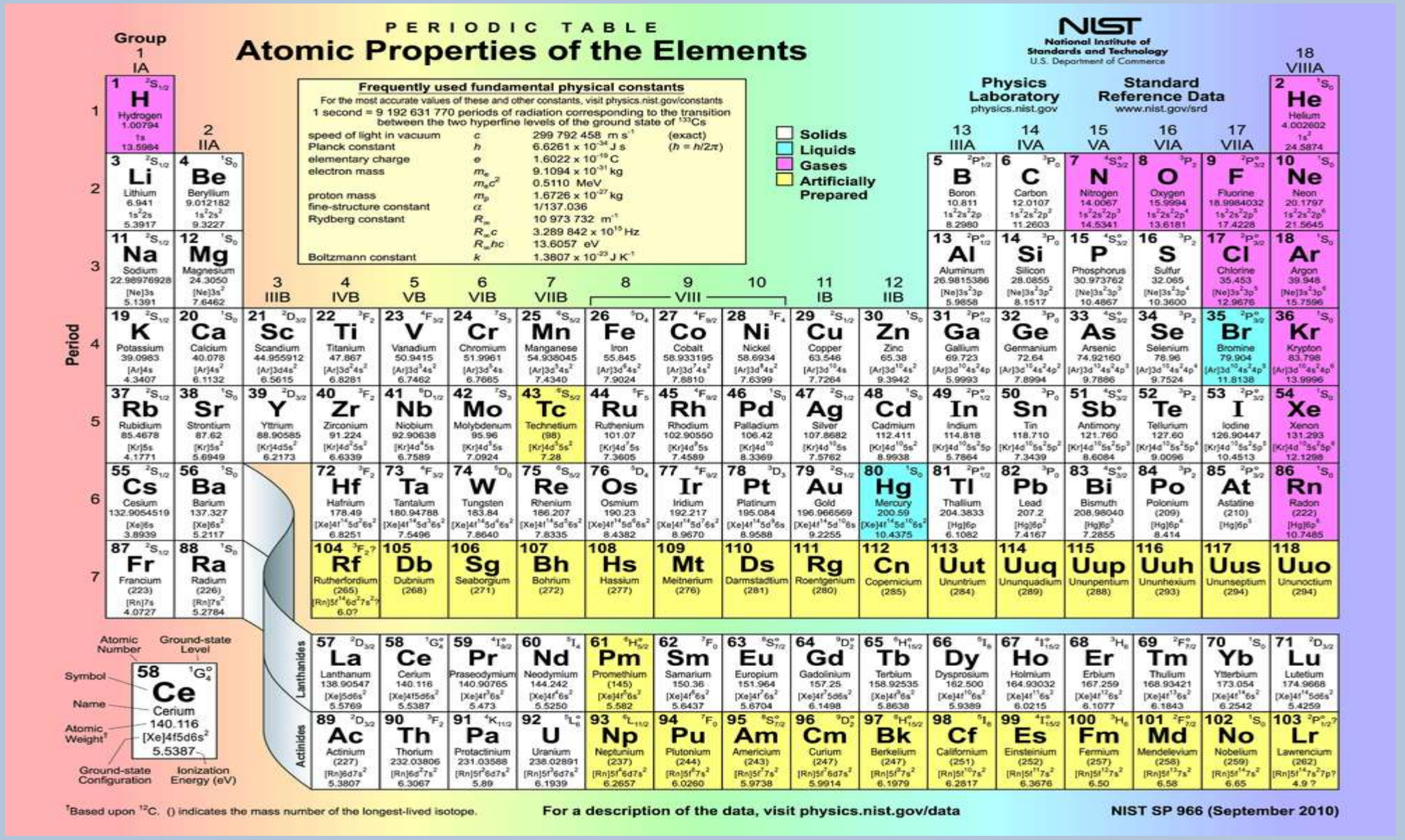
The new industrial revolution

- **The meaning of manufacturing**

What lies behind manufacturing

- Manufacturing = Materials + Energy + Ideas
- The creative force behind 10bn unique products
- It accounts for 16 per cent of world economy (10pc of UK economy)
- It employs about 300m people or roughly 5 pc of world population.(In the UK, manufacturing employment about 2m, or about pc of population)
- The price effect: manufacturing characterised by deflation (compared to services)

The table of life



Bringing order to chaos
(countering the 2nd law of thermodynamics)

10,000 years of evolution in adding information to materials

Stone age axe : resources needed to make one unit

Number of manufacturing workers: 1

Number of sites: 1

Number of materials: 1

Skills honed by learning over decades

Where we are now

The iPhone 5: resources needed to make one unit

Number of manufacturing workers: 5,000

Number of sites:50

Number of materials: 50

Skills honed by science and technology advances

The new industrial revolution

- The meaning of manufacturing
- **Global trends – where Britain fits in**

1800 – At the dawn of modern manufacturing

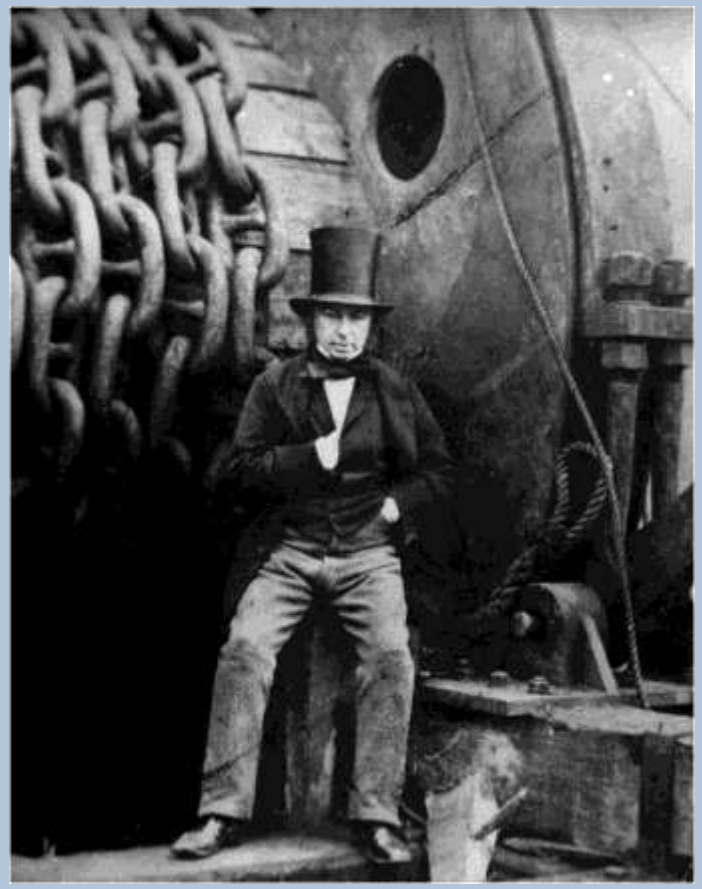
Early Chinese astronomical clock

Share of world production

1. China	33.3%
2. India*	19.7%
3. Russia	5.6%
4. UK	4.3%
5. France	4.2%
6. Germany**	3.5%
6. Japan	3.5%

Source: Paul Bairoch data; *includes Pakistan; ** German states

1900 – Britain's century; but the US taking over



Isambard Kingdom Brunel, pioneer of the First Industrial Revolution

Share of world production

1. US	23.6%
2. UK	18.5%
3. Germany	13.2%
4. Russia	8.8%
5. France	6.8%
6. China	6.2%
7 . Japan	3.5%

Source: Paul Bairoch data

2012– China regains the lead

Giant Sany crane

Share of world production

1. China	22.4%
2. US	17.5%
3. Japan	9.4%
4.Germany	6.0%
5. South Korea	2.8%
6. Italy	2.4%
7.Russia	2.3%

Source: UN data

Growth in manufacturing output 2000-12

China +241%

Britain - 9%

Europe + 14%

World + 52%

France + 1%

Germany + 23%

Japan + 13%

US +20%

(Constant 2005 dollars, Source: UN)

Who's re-shoring?

Changes in shares of world manufacturing (2011-12)

China	+1.8 percentage points
US	+ 0.3 percentage points
Mexico/Australia/Russia	+ 0.1 percentage points
Brazil/Germany	- 0.5 percentage points
Italy	-0.4 percentage points
Japan	-0.3 percentage points
Spain/India	-0.2 percentage points
Switzerland/UK	-0.1 percentage points

(Source: UN)

World manufacturing output 2012 ($bn, current prices)

1. China	2,556	(22.4%)
2. US	1,994	(17.5%)
3. Japan	1,076	
4. Germany	686.6	
5. S Korea	315.8	
6. Italy	279.9	
7. Russia	262.4	
8.Brazil	253.8	
9.India	239.5	
10. France	233.1	
World	11,426	Source: UN

World manufacturing output 2012 ($bn, current prices)

11.UK	219.5
12. Indonesia	210.2
13. Mexico	205.0
14. Canada	185.6
15. Spain	161.8
16. Taiwan	130*
17. Turkey	123.2
18. Australia	120.7
19. Switzerland	113.4
20. Thailand	111

Source: UN, IHS Global Insight
* estimate

World manufacturing output/ population 2012 ($bn, current prices)

(top 20 manufacturing nations only)

1. Switzerland	14,125
2. Japan	8,459
3. Germany	8,277
4. S Korea	6,428
5. US	6,280
6. Taiwan	5,579
7. Canada	5,344
8. Australia	5,260
9. Italy	4,588
10. France	3,535
World	1,616

World manufacturing output / population 2012 ($bn, current prices)

(top 20 manufacturing nations only)

11. UK	3,492
12. Spain	3,468
13. Mexico	1,690
14. China	1,865
15. Russia	1,832
16. Thailand	1,664
17. Turkey	1,662
18. Brazil	1,291
19. Indonesia	867
20. India	190
World	1,616

World manufacturing output 2012 (percentages)

Asia 43%
Europe 26%
N America 22%
S America 3%
Africa 2%
Rest of world 4%

Source: UN

World manufacturing deflation

A typical factory-produced item today typically sells for half the price it sold for in 1970 (relative to overall global inflation)

The new industrial revolution

- The meaning of manufacturing
- Global trends – where Britain fits in
- **The 5th industrial revolution**

The New Industrial Revolution (Fifth Industrial Revolution)-Key factors

1. Blended technology
2. Mass personalisation/customisation
3. Focus on specialisation/niches
4. Environmental stewardship
5. Service dimension
6. Global networking
7. Cluster dynamics
8. The new geography – China/India/S America
9. The maverick manufacturer

The New Industrial Revolution

1. **Blended technology**

The A350: many key technologies

Glass for flat-screen TVs/monitors...

Blended technology: the biotech/electronics mix

The New Industrial Revolution

1. Blended technology
2. **Mass personalisation/customisation**

Technology/business methods make customisation more affordable and practicable...

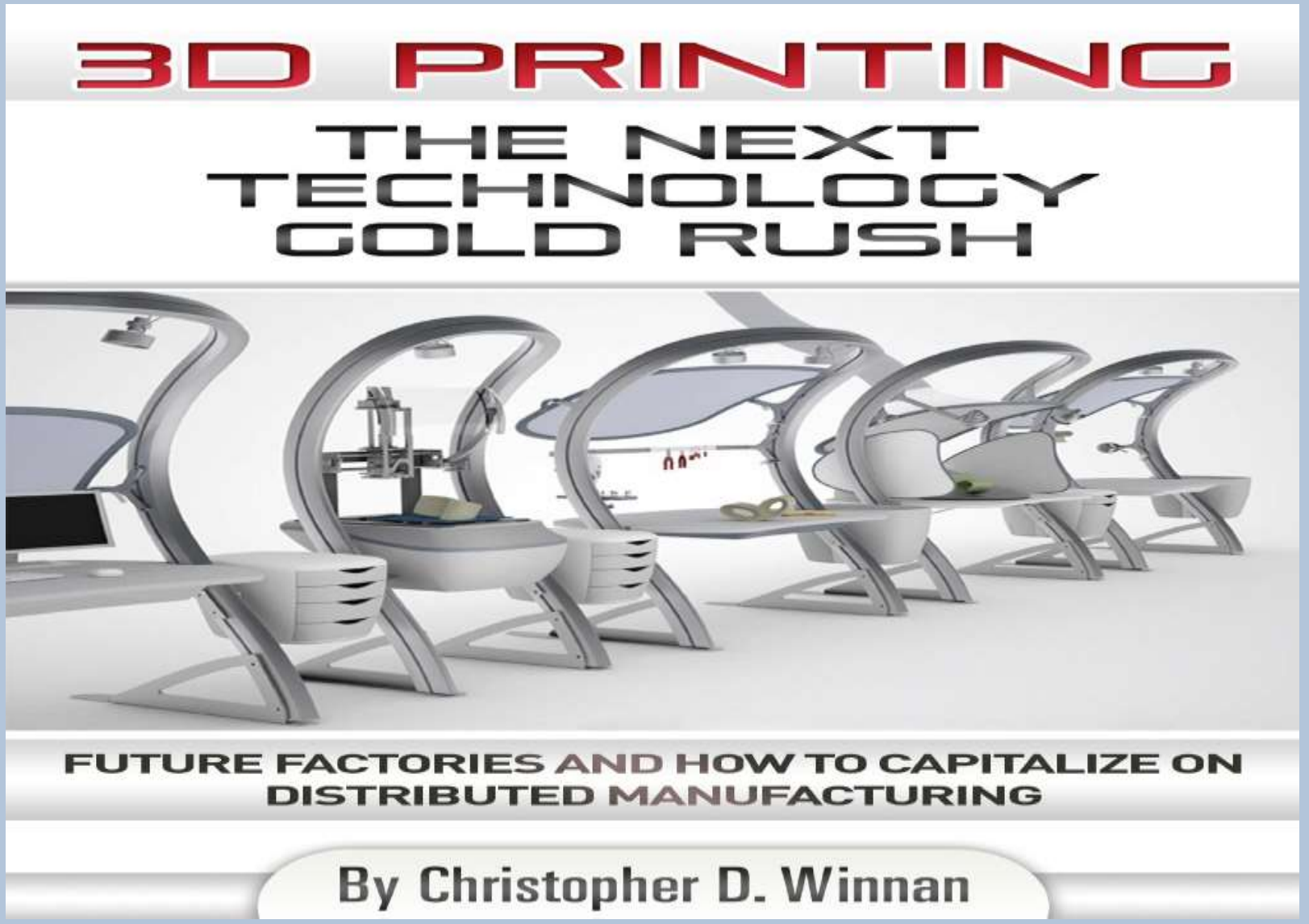
The Zara production model – short production runs, made near the customer – Tibard chef's uniforms (Manchester)

The New Industrial Revolution

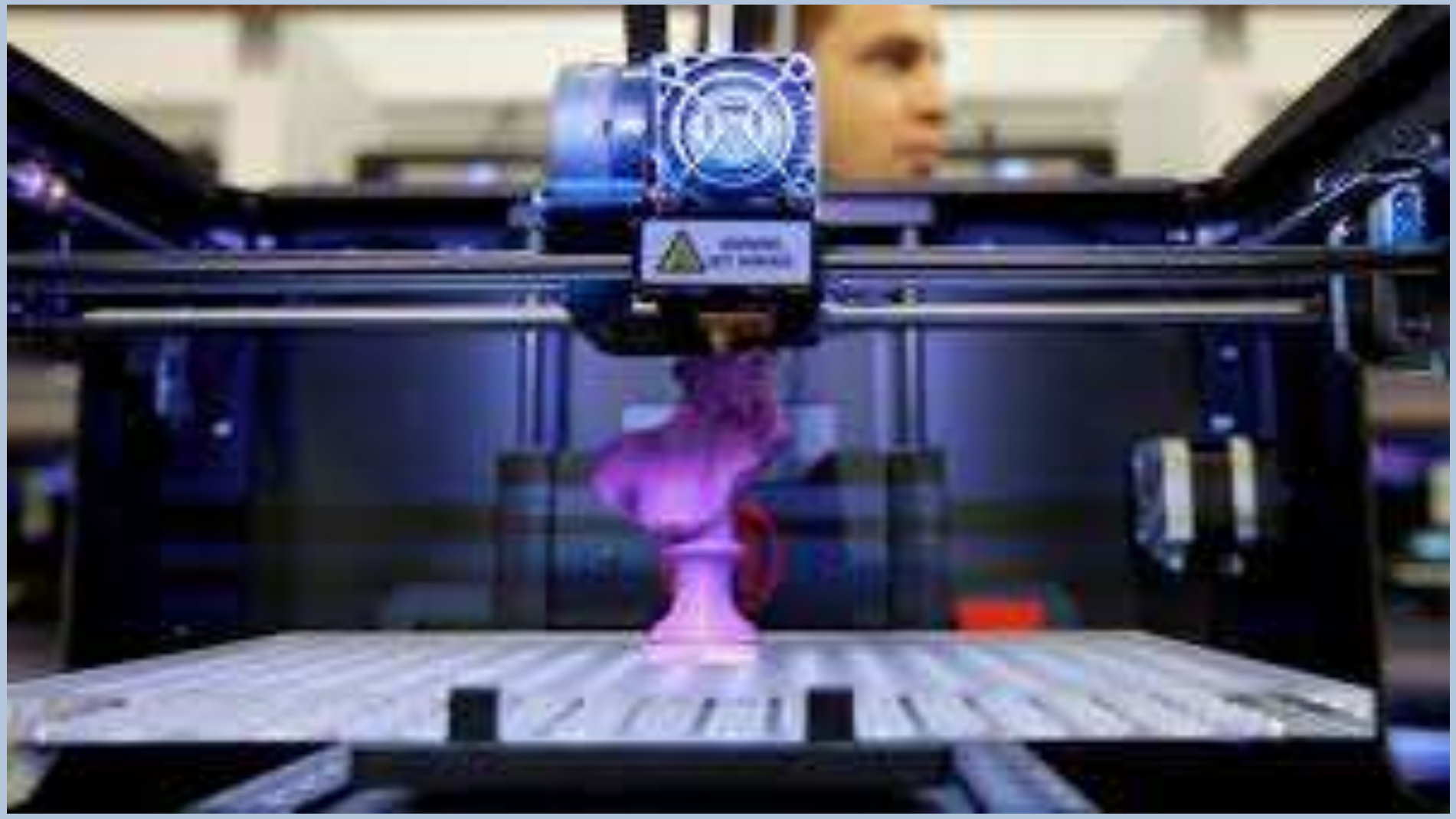
1. Blended technology
2. Mass personalisation/customisation

3D Printing adds new tools

The new technology of “additive manufacturing”



How 3D printing machines work



Renishaw enters this new field with a £400,000 machine

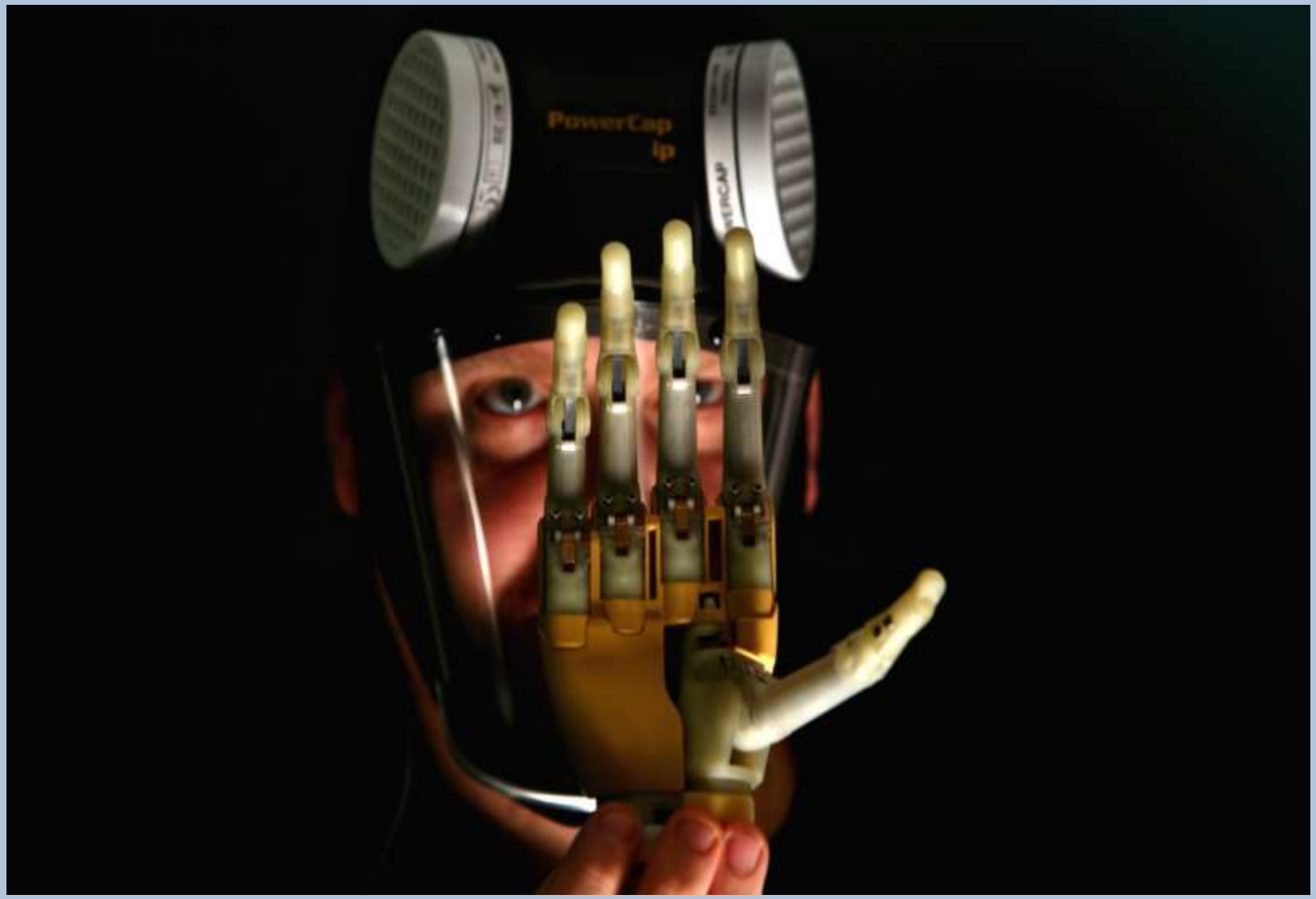
Abe Reichental and his 3D-printed guitar

3D printing machines...use in fashion industry

The New Industrial Revolution

1. Blended technology
2. Mass personalisation/customisation
3. **Focus on specialisation/niches**

Manufacturing specialisation : leverage innovation



Tunnelling machines – Herrenknecht (made in Germany)

The New Industrial Revolution

1. Blended technology
2. Mass personalisation/customisation
3. Focus on specialisation/niches
4. **Environmental stewardship**

Environmental stewardship: Dando Drilling (Littlehampton)

Environmental stewardship: grow your own wool

The New Industrial Revolution

1. Blended technology
2. Mass personalisation/customisation
3. Focus on specialisation/niches
4. Environmental stewardship
5. **Service dimension**

Service dimension at Cammell Laird (Birkenhead)

Different industries, same skills

Servitisation : Manufacturers as consultants

The New Industrial Revolution

1. Blended technology
2. Mass personalisation/customisation
3. Focus on specialisation/niches
4. Environmental stewardship
5. Service dimension
6. **Global networking**

What's the link between.....

.....Chinese electronics factories....

....the Westwind air bearing company in Dorset .....

.....and a factory in Cheshire countryside?

Global networking: R.A.Chilton coatings company near Chester

The New Industrial Revolution

1. Blended technology
2. Mass personalisation/customisation
3. Focus on specialisation/niches
4. Environmental stewardship
5. Service dimension
6. Global networking
7. **Cluster dynamics**

Clusters: NW England textiles sector (Panaz)

The New Industrial Revolution

1. Blended technology
2. Mass personalisation/customisation
3. Focus on specialisation/niches
4. Environmental stewardship
5. Service dimension
6. Global networking
7. Cluster dynamics
8. **The new geography – China/India/S America**

China dimension: Jaguar Land Rover (Halewood plant)

Jaguar Land Rover: long-term promise paying off

Made in Rochdale: the Chongqing connection

The New Industrial Revolution

1. Blended technology
2. Mass personalisation/customisation
3. Focus on specialisation/niches
4. Environmental stewardship
5. Service dimension
6. Global networking
7. Cluster dynamics
8. The new geography – China/India/S America
9. **The maverick manufacturer**

Maverick approch: Thomas Heatherwick – designer/engineer

The maverick manufacturer: go with the flow

The new industrial revolution

- The meaning of manufacturing
- Global trends – where Britain fits in
- The 5th industrial revolution
- **Opportunities for Britain**

Encourage entrepreneurs: Ning Li of Made.com

Support specialists : Sir David McMurtry of Renishaw

Develop cluster thinking

Add skills to old industries

Add service skills: manufacturers as physicians

Possibilities abound