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Engaging students in experiential learning

Design-driven entrepreneurship in industrial design

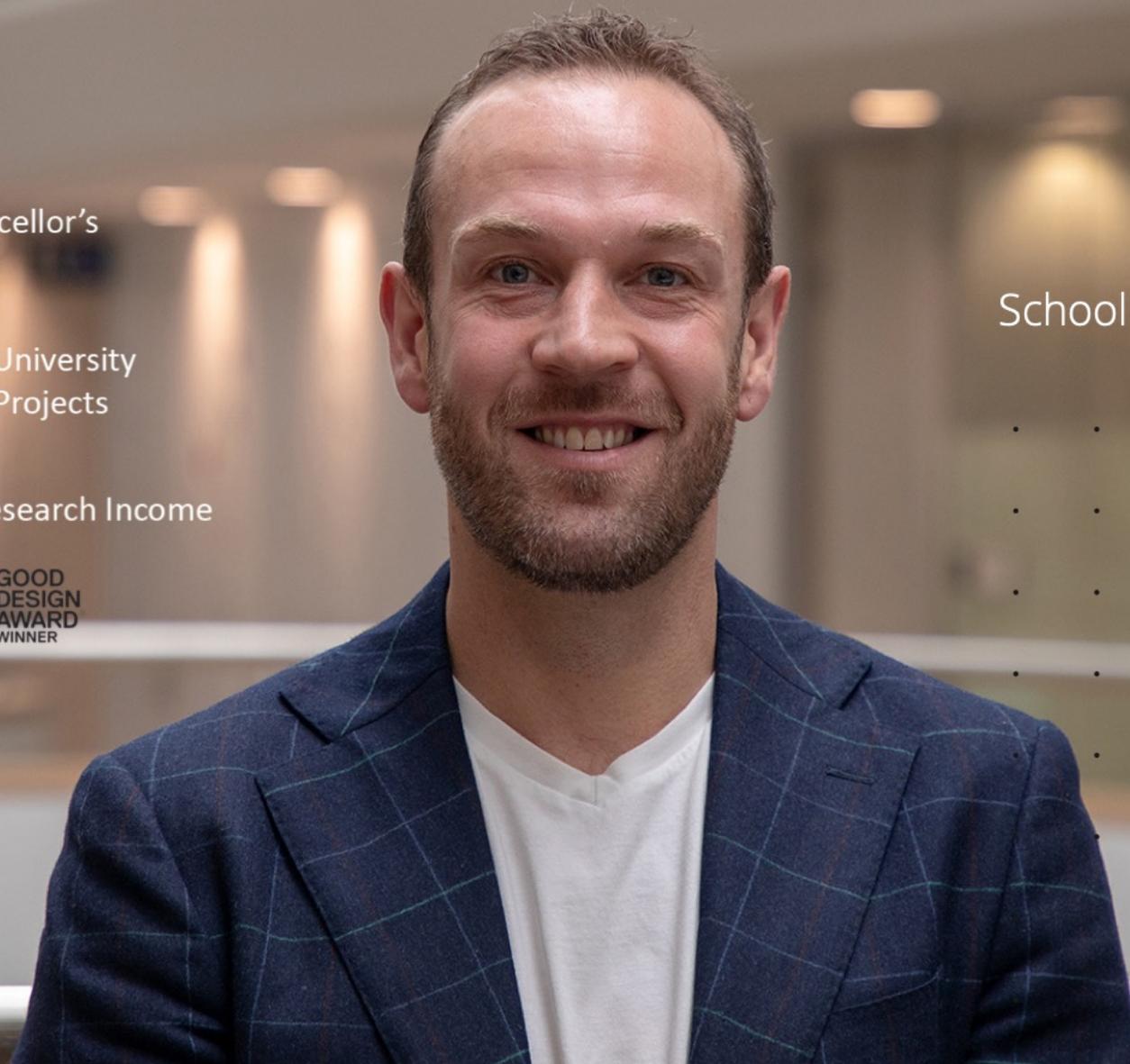
Professor Blair Kuys

19 May 2022



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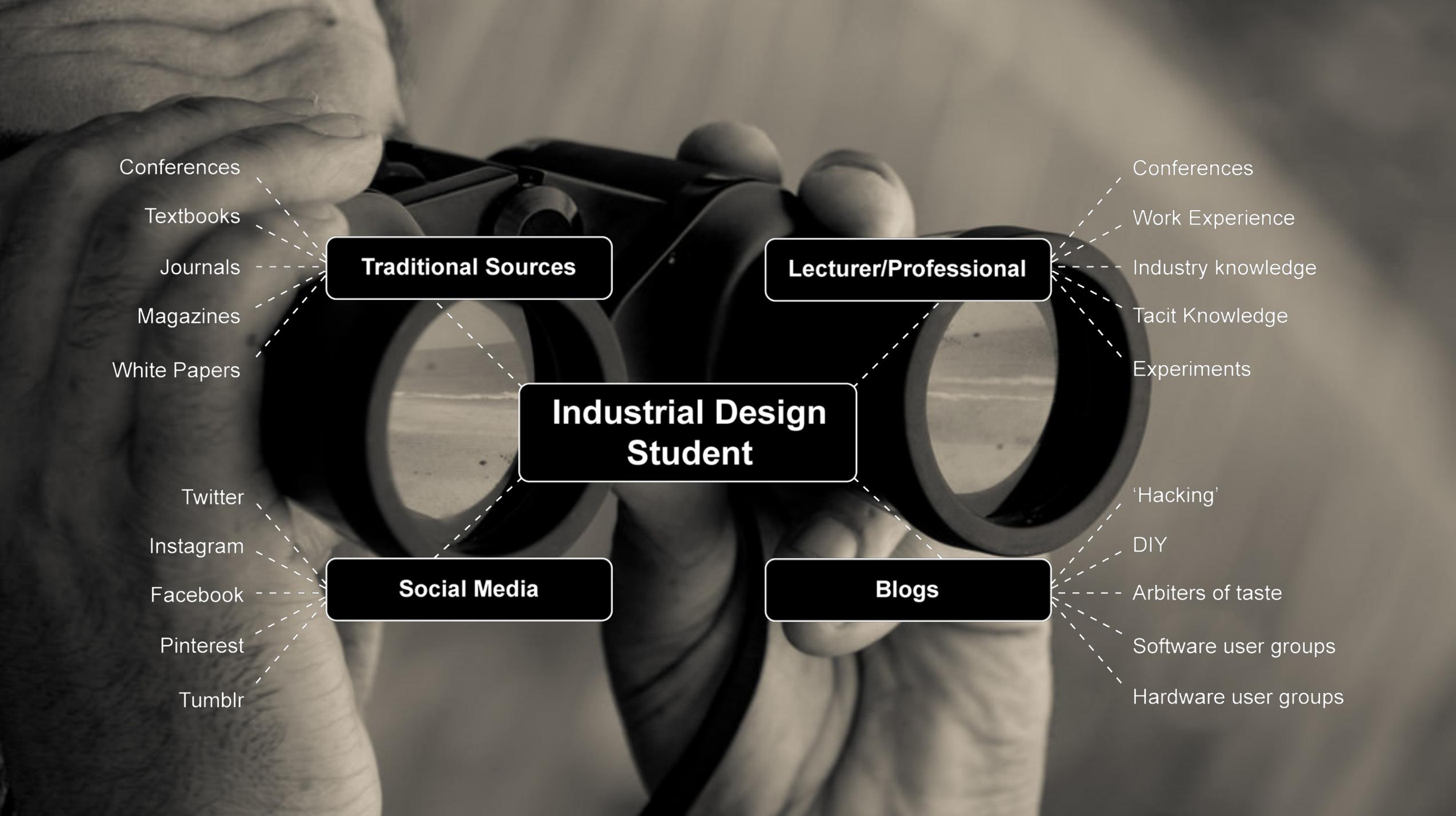
Professor Blair Kuys
Associate Dean Research
School of Design and Architecture



Connectivist learning theory used to benefit industrial design

A methodology for understanding learning in a digital age





Traditional Sources

- Conferences
- Textbooks
- Journals
- Magazines
- White Papers

Lecturer/Professional

- Conferences
- Work Experience
- Industry knowledge
- Tacit Knowledge
- Experiments

Industrial Design Student

Social Media

- Twitter
- Instagram
- Facebook
- Pinterest
- Tumblr

Blogs

- 'Hacking'
- DIY
- Arbiters of taste
- Software user groups
- Hardware user groups

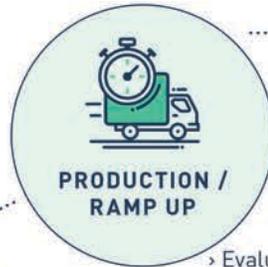
INNOVATING MANUFACTURING SMEs

> Profit from successful industry-university engagement reinvested into new product opportunities



> Marketing
> Buying groups
> Investors

DIRECT AVENUE TO MANUFACTURING



> Evaluation
> Manufacture



> Detail design

> The specialised product development team MUST be knowledgeable in engineering analysis, product refinement, prototyping and design for manufacture. These stages are critical to translate research findings into commercial products.



> CAD
> Computer modeling



> Manufactured products



INDUSTRY UNIVERSITY ENGAGEMENT



> Specialised product development expertise

PRODUCT DEVELOPMENT PROCESS



> Idea generation
> Concept selection
> Low fidelity prototyping

> Detailed project proposal MUST be developed between the manufacturer and the university. This will include the following:

1. Project challenge (WHY is the research needed?)
2. Project methodology (HOW will it be executed?)
3. Project outcome(s) (WHAT are the deliverables?)
4. Project budget. (Activity - Time - Deliverables - Costs)

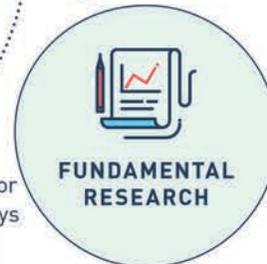
ADVANCED DESIGN AND ENGINEERING SKILLS

NEW IDEAS

DESIGNATED PROJECT MANAGER

ACCURATE AND HONEST PROJECT PLAN SHOWING PROJECT DELIVERABLES. FORTNIGHTLY UPDATES SENT TO CLIENT

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> Generative Research
> Foundational Research
> Qualitative and Quantitative analysis

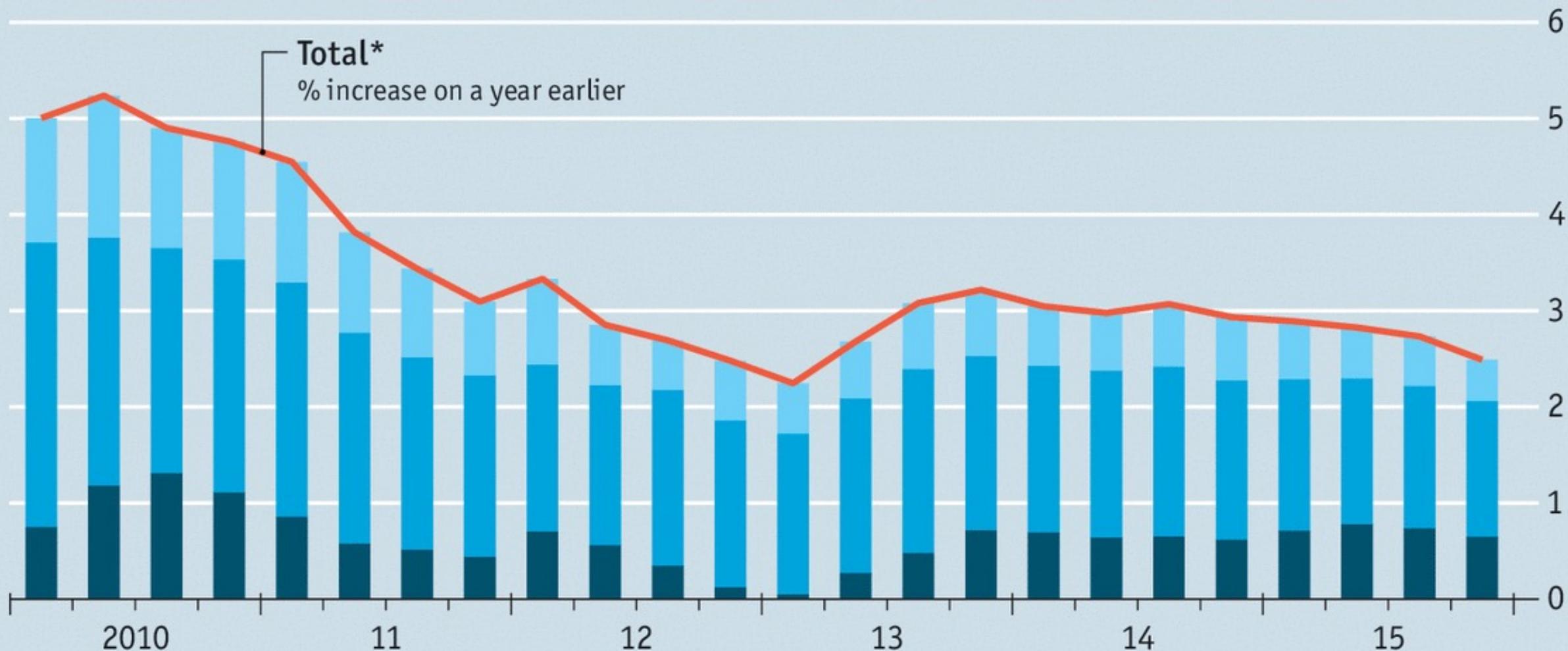


> Research & Development

World GDP

Contribution to growth, percentage points

Rich countries BRICs Other emerging markets



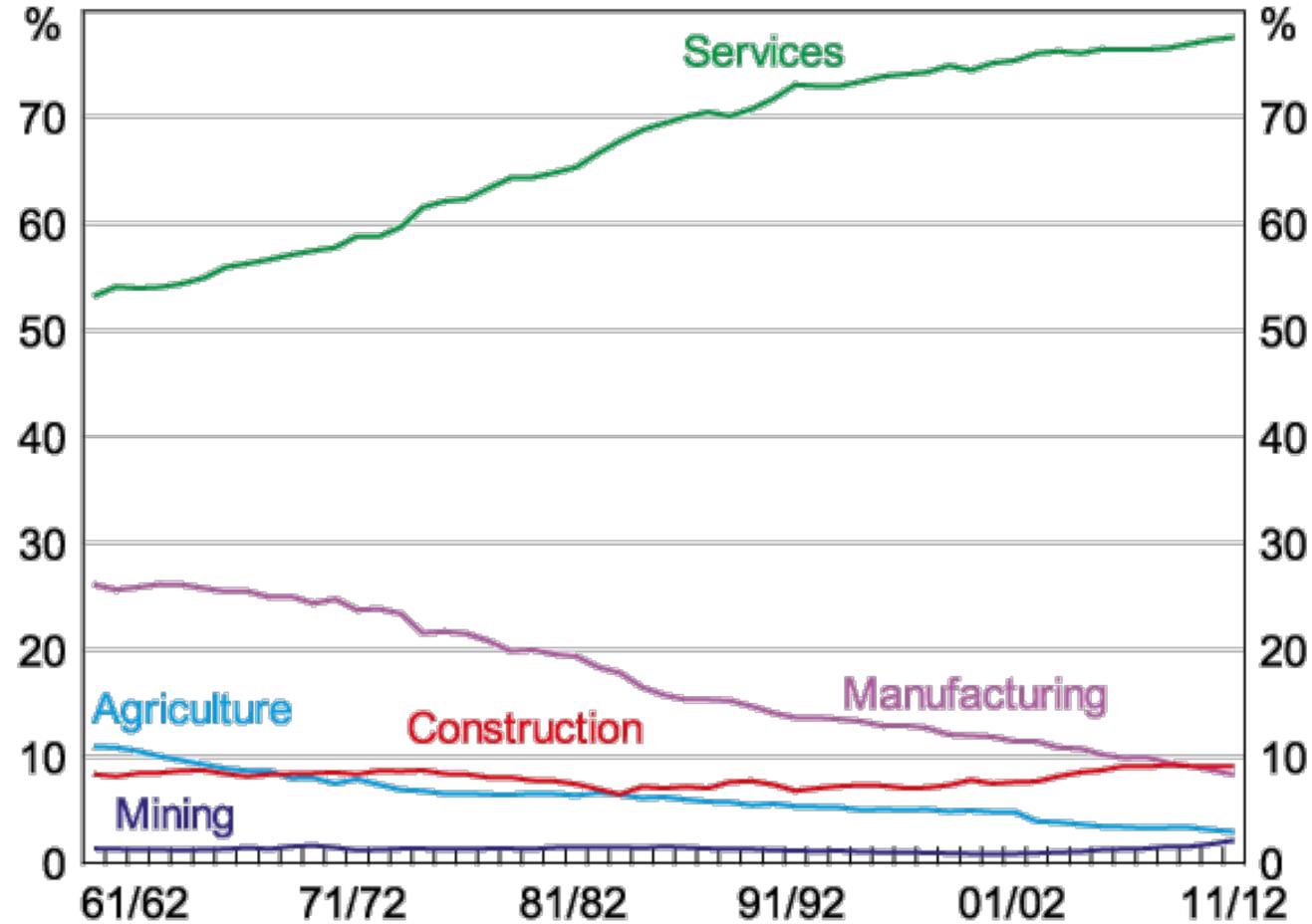
*Estimates based on 58 economies representing 89% of world GDP. Weighted GDP at purchasing-power parity

Sources: IMF; *The Economist*



Employment by Industry

Share of total*

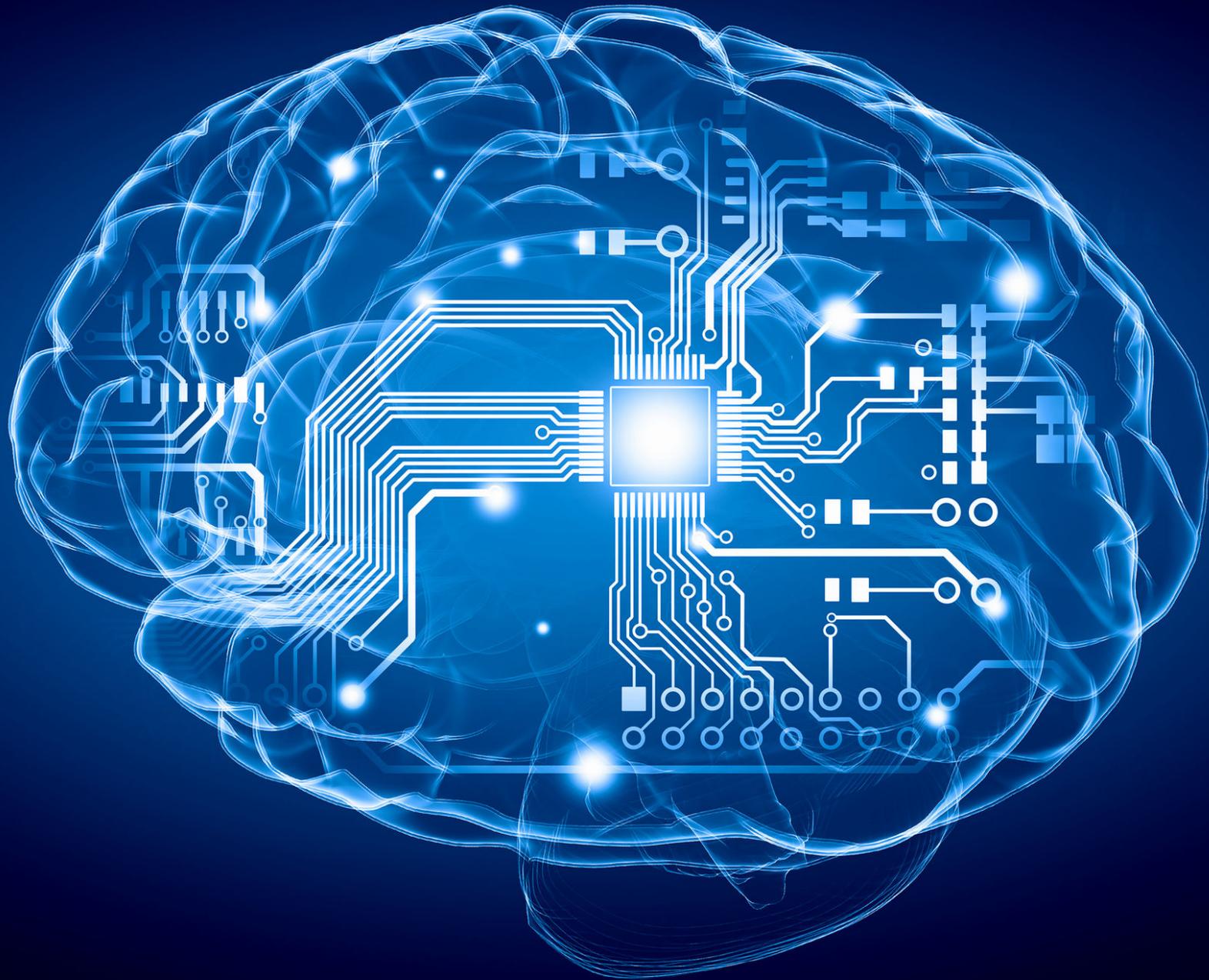


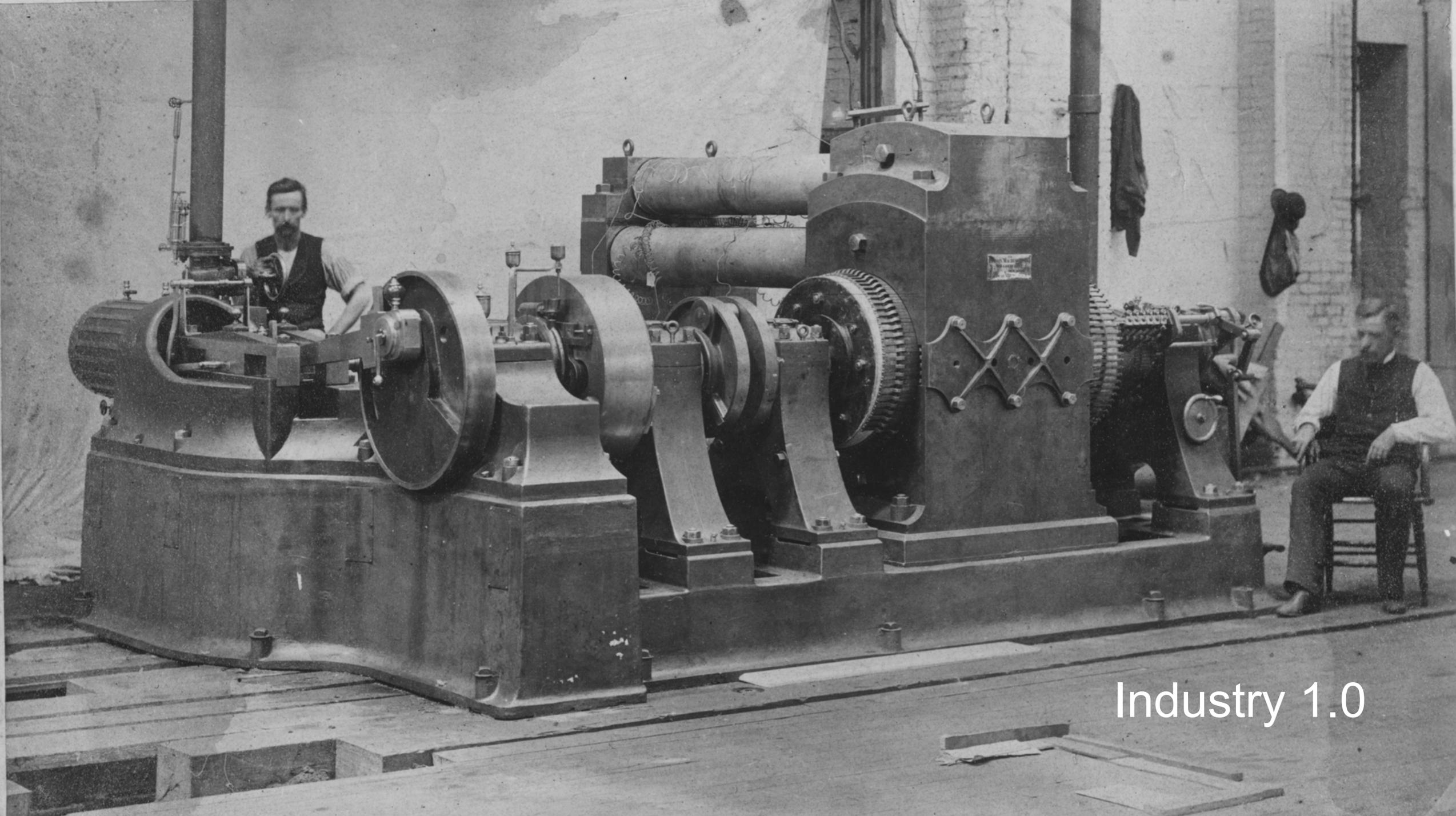
* Estimate for 2011/12

Sources: ABS; RBA; Withers, Endres and Perry (1985)



Machines just make things



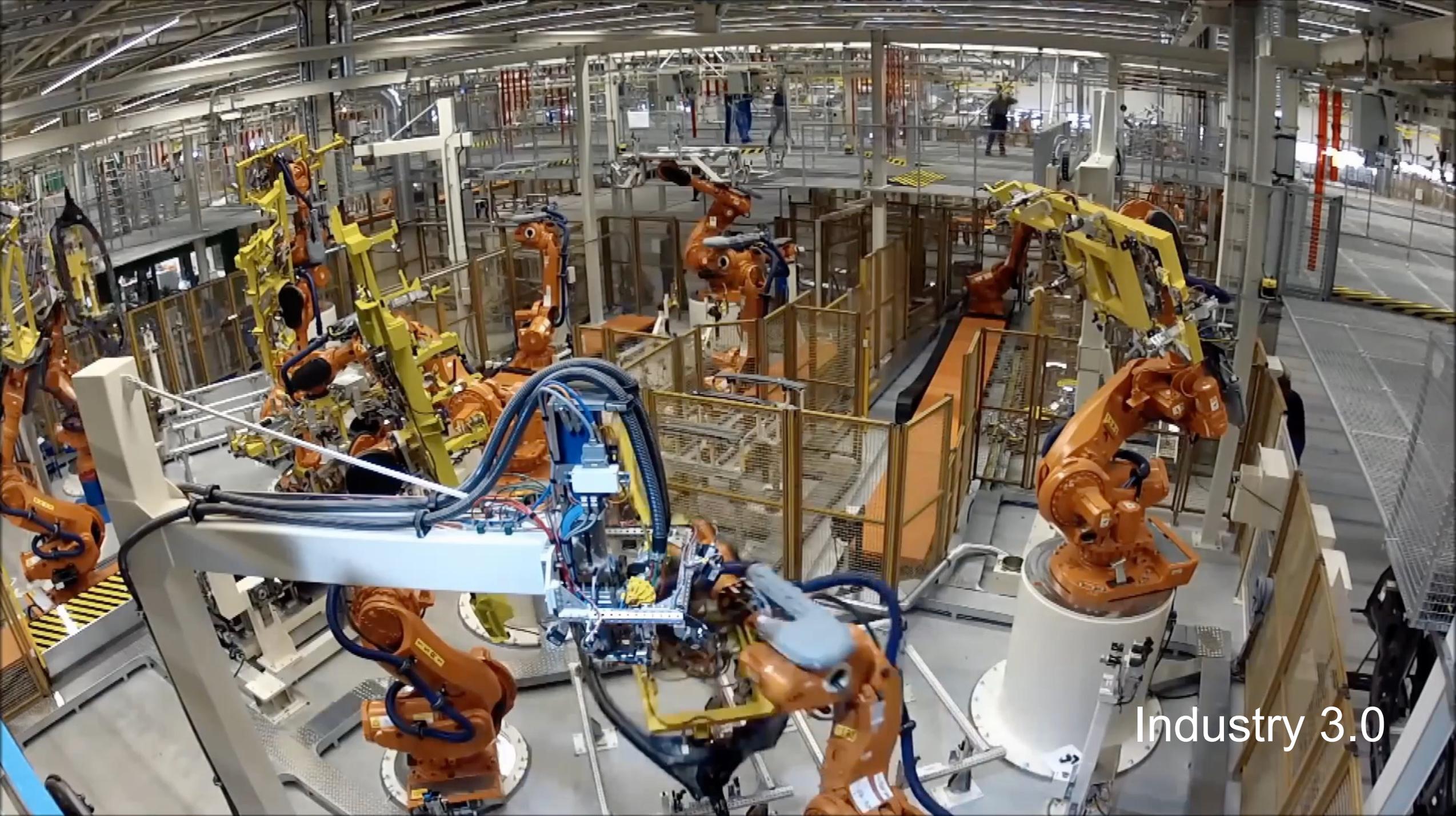


Industry 1.0

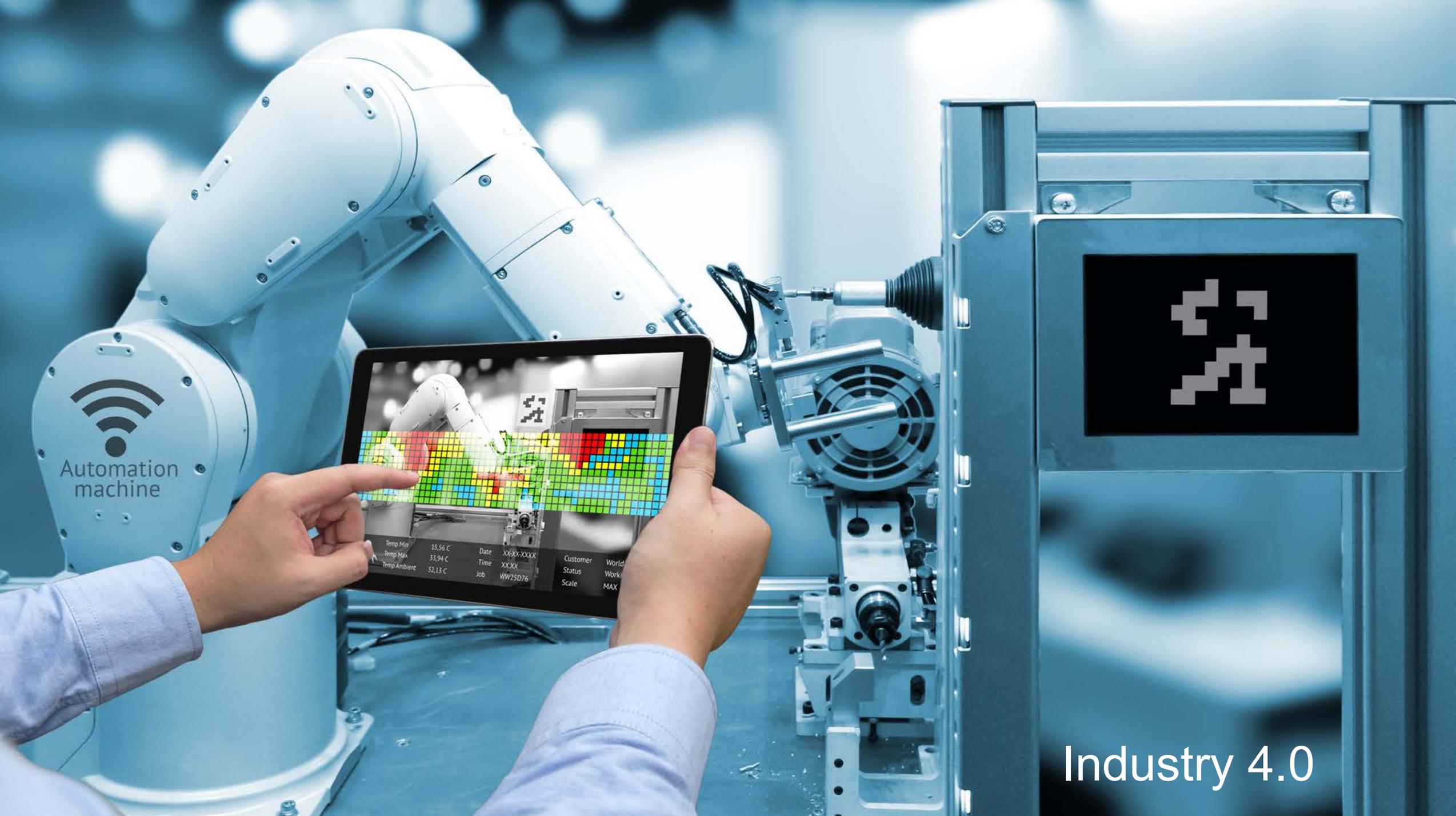


Industry 2.0





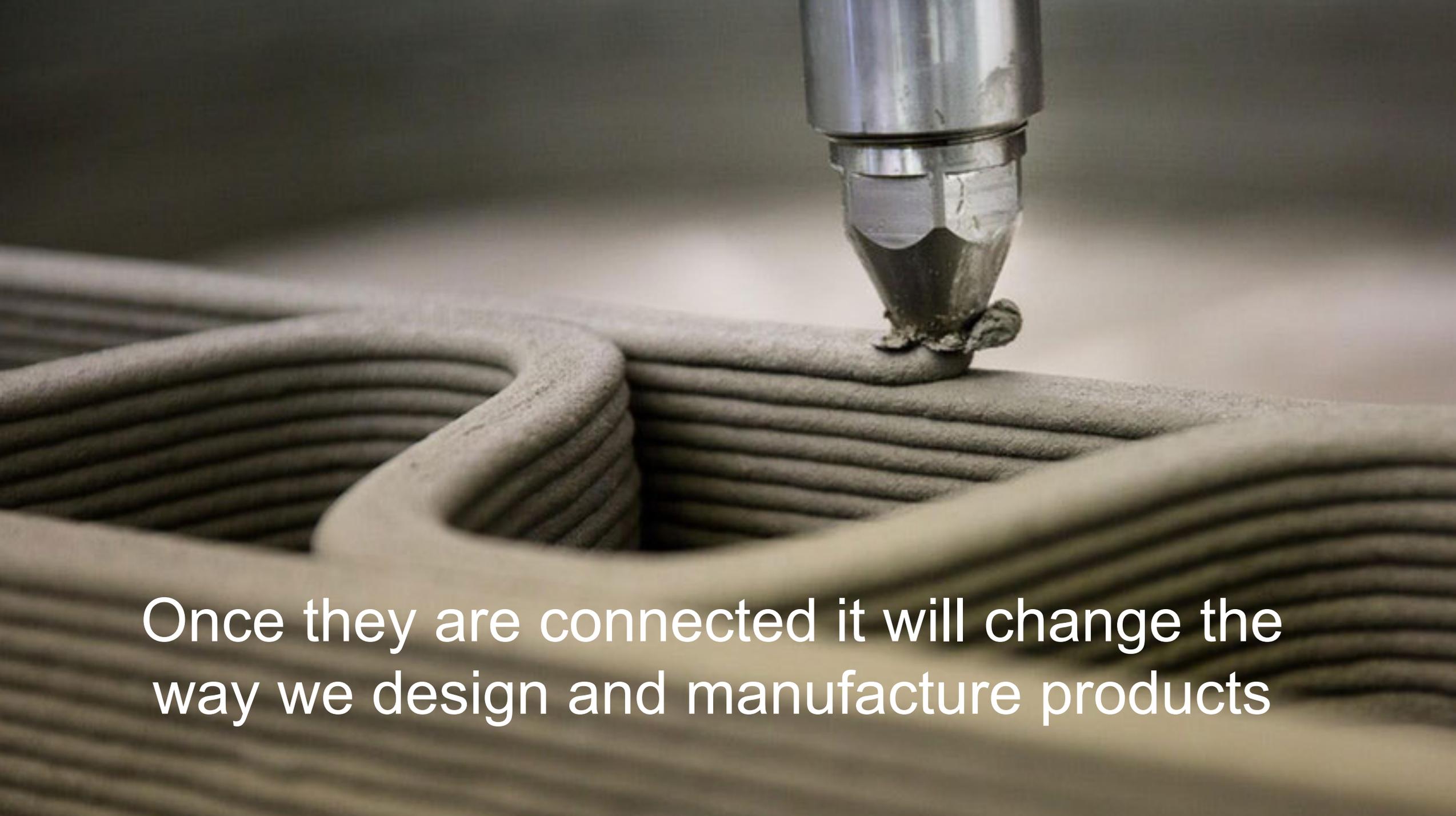
Industry 3.0



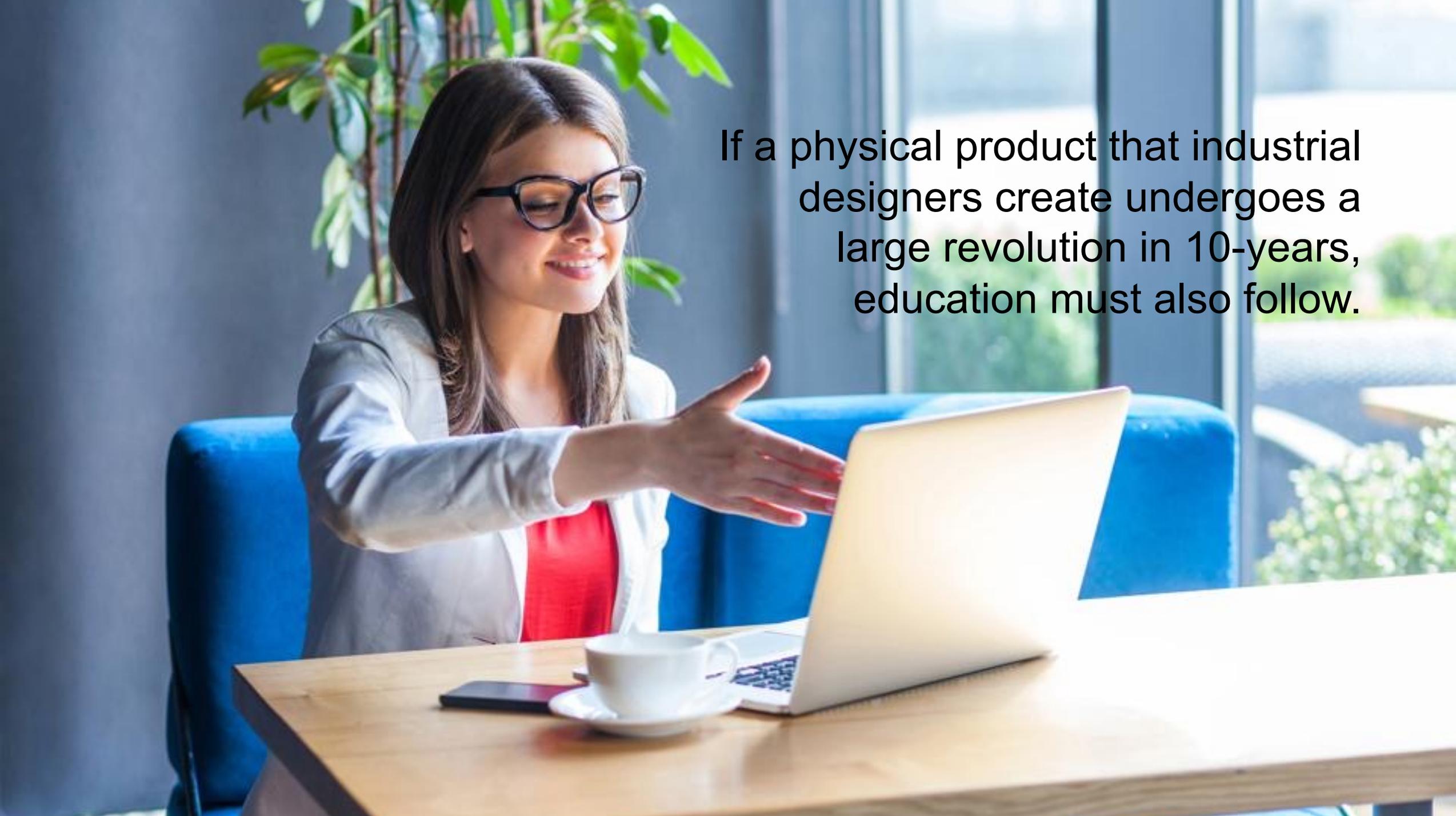
Automation
machine

Temp Min	15.56 C	Date	XXXX-XXXX	Customer	World
Temp Max	33.94 C	Time	XXXX	Status	Worki
Temp Ambient	32.13 C	Job	WW25D76	Scale	MAX

Industry 4.0

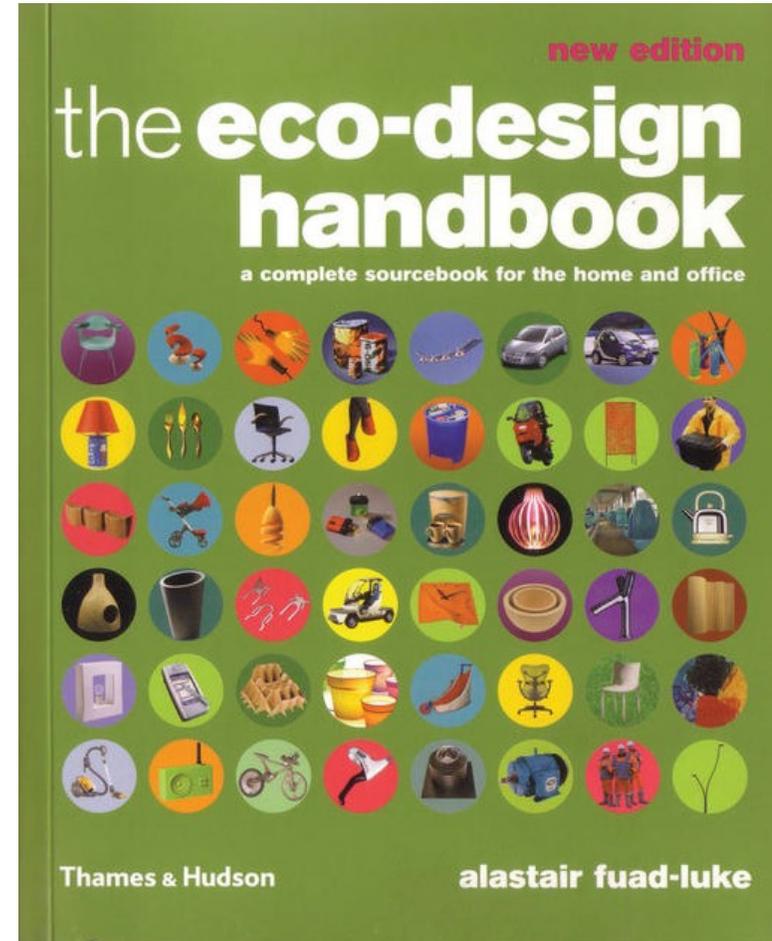


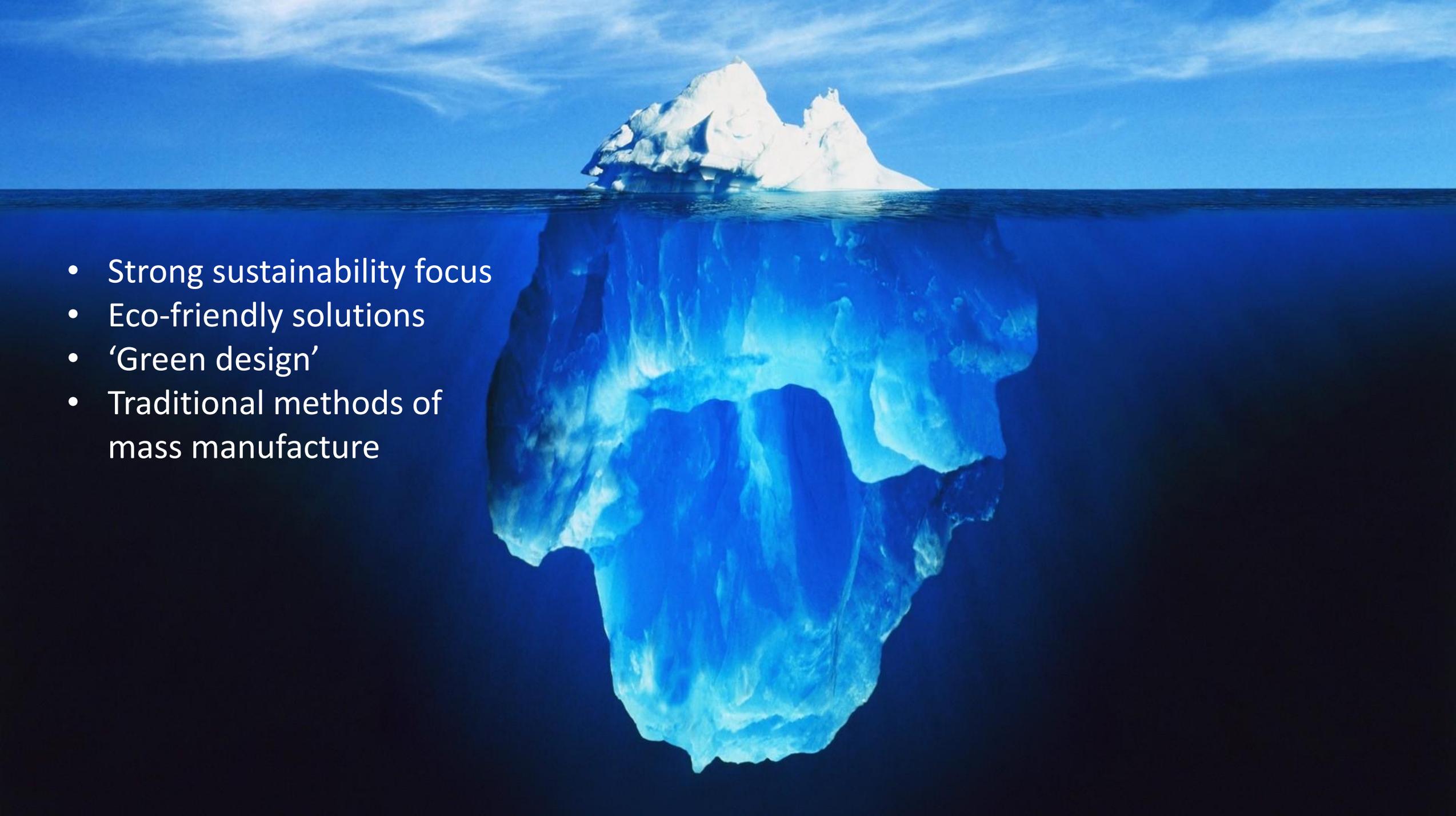
Once they are connected it will change the way we design and manufacture products

A woman with long brown hair and black-rimmed glasses is sitting at a wooden table in a bright, modern office or cafe. She is wearing a white blazer over a red top. She is looking at a silver laptop on the table and gesturing with her right hand towards the screen. On the table, there is also a white coffee cup on a saucer and a black smartphone. The background features a large window with a view of greenery outside and a blue armchair.

If a physical product that industrial designers create undergoes a large revolution in 10-years, education must also follow.

20-years ago...



- 
- Strong sustainability focus
 - Eco-friendly solutions
 - 'Green design'
 - Traditional methods of mass manufacture

Article

The Priority Given to Sustainability by Industrial Designers within an Industry 4.0 Paradigm

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Abstract Industrial design is intrinsically linked to manufacturing; however, what is required of industrial design to adapt to new changes brought on by Industry 4.0 in manufacturing is unknown. Current literature gives little insight into how industrial designers need to evolve to the current developments in manufacturing to remain value drivers in an Industry 4.0 paradigm. There is minimal research describing the link between industrial design, Industry 4.0 and the effect this will have on sustainability. We conducted an extensive survey of 190 respondents from 53 countries to establish the present state of industrial design practice globally and to better understand the priority sustainability is given by practicing industrial designers. Qualitative data showed a desire for improved sustainable processes; however, quantitative data contradicted this, showing “sustainability” as one of the lowest ranked areas of importance in design practice for industrial designers. While sustainability—especially in manufacturing—demands more prominent change as industrial design adapts to an Industry 4.0 manufacturing paradigm, it seems that junior industrial designers do not currently see this as a priority.

Keywords: industrial design; Industry 4.0; sustainability; manufacturing; priority; value; sustainable



Citation: Kuys, B.; Koch, C.; Renda, G. The Priority Given to Sustainability by Industrial Designers within an Industry 4.0 Paradigm. *Sustainability* 2022, 14, 76. <https://doi.org/10.3390/su14010076>

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1. Introduction

Establishing close relationships or close partnerships with manufacturers is one way that industrial designers can stay abreast with manufacturing change. It is also an enabler for designers to influence manufacturers to be more innovative, more sustainable and more flexible when working with designers. In the eyes of industrial designers, the aspect of sustainability is not only concerned with ecological issues but also with economic sustainability. However, industrial designers are of the belief that the barrier to be more “sustainable” seems to rest with profit-driven manufacturers. There are existing frameworks showing how to integrate Industry 4.0 alongside sustainability practices into a company [1–3]; however, the role of the industrial designer in the process of integration is largely neglected. Although “design” is mentioned in previous literature on this topic, the designers themselves are not included. The survey conducted for this study took the perspectives of practicing industrial designers rather than company managers, and a knowledge gap was apparent when a number of industrial design respondents were unfamiliar with existing frameworks. This study is exploratory and shows that industrial designers need to better understand existing frameworks for Industry 4.0 and sustainable integration to be a driving force in this manufacturing paradigm. This research reveals that it is the systems that surround the manufacturing procedures that are crucial to both ecological and economic sustainability, not only the methods of production themselves, and it is the designer who needs to evolve to design for an Industry 4.0 manufacturing environment. Industrial designers support future manufacturing to be more sustainable; however, current practice suggests this is not the highest priority when designing.

Much of the existing literature within sustainability for Industry 4.0 focuses on the overall manufacturing environment, focusing on a circular economy of supply. Little is

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Method

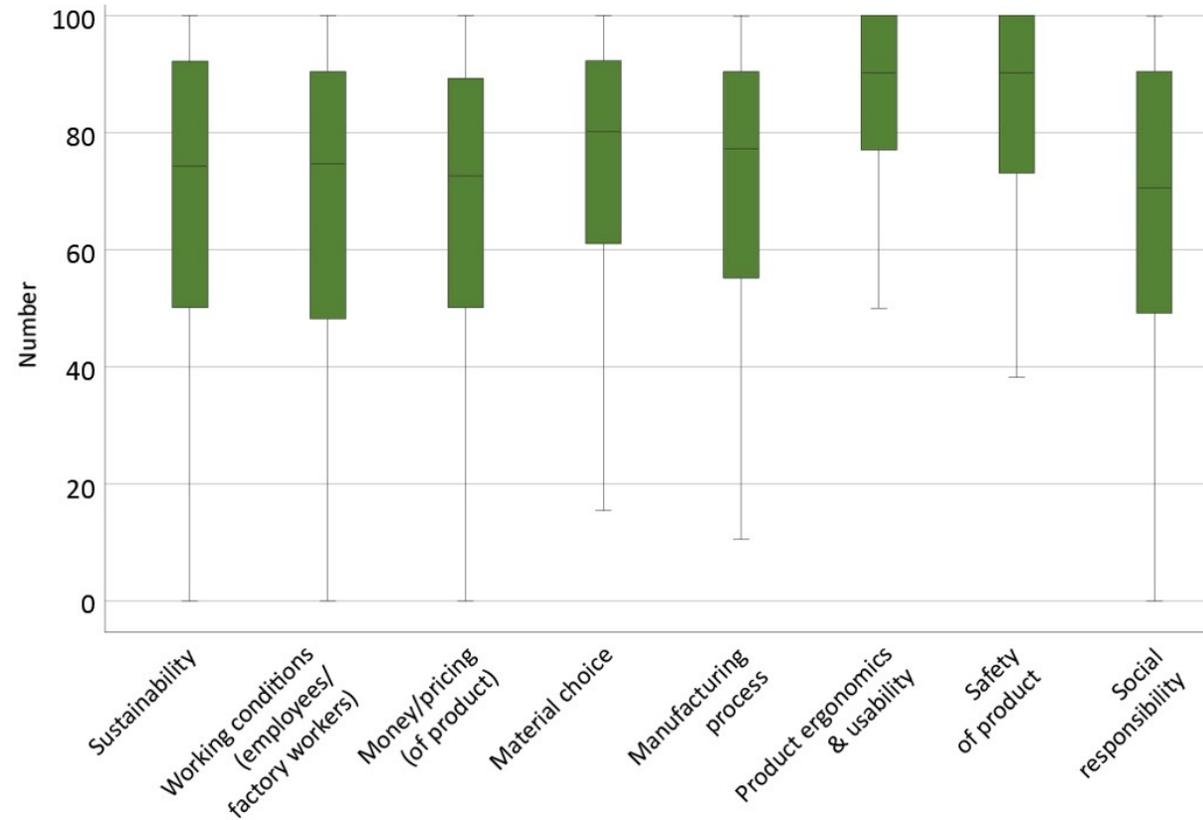
We conducted an extensive survey of 190 respondents from 53 countries to establish the present state of industrial design practice globally and to better understand the priority sustainability is given by practicing industrial designers.



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Findings

Where do you rank the importance of the following in regard to your design practice? (in %).



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Discussion

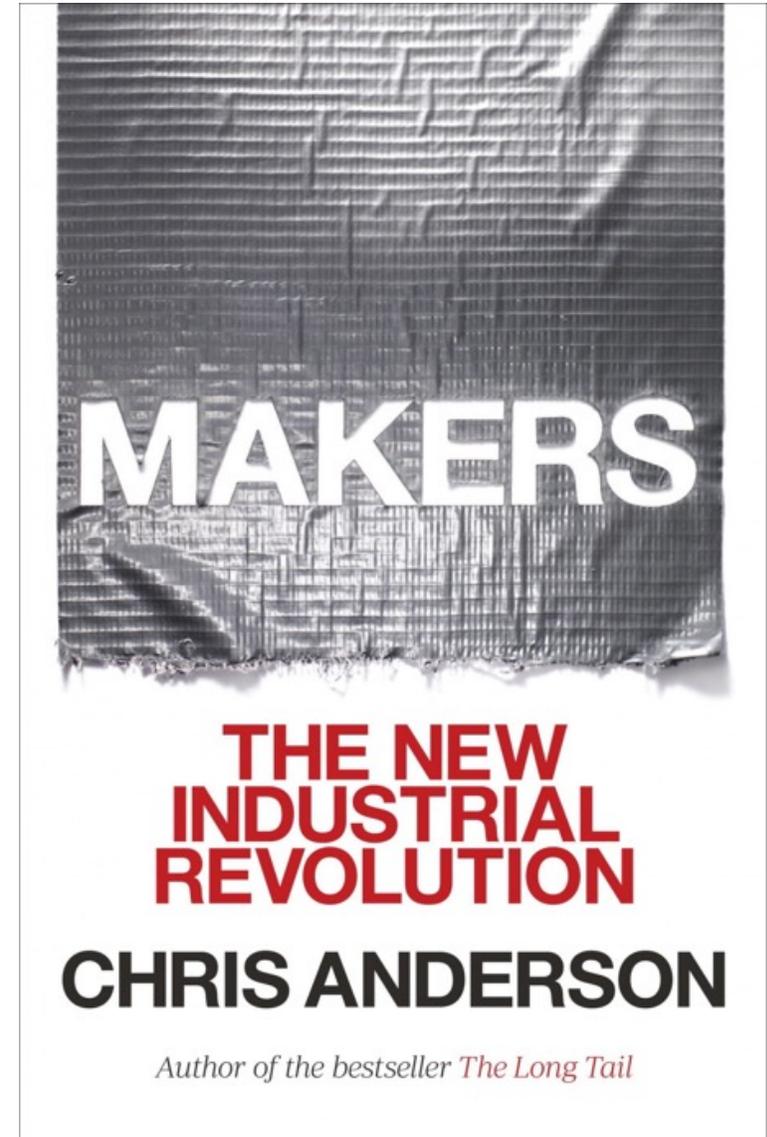
Data shows a clear disconnect between issues of environmental and social responsibility between industrial designers and their opinion of manufacturers.

Manufacturers—in the eyes of the industrial design respondents—were mainly profit and efficiency driven, taking on an introspective approach, compared to the holistic stance of the industrial designers.

With the emergence of Industry 4.0 we see a trend for industrial designers to work much more closely with their manufacturing counterparts for mutually beneficial, and importantly, sustainable product outcomes.



Now...



amazon

The Amazon logo consists of the word "amazon" in a bold, lowercase, sans-serif font. Below the word is a curved orange arrow that starts under the letter 'a' and ends under the letter 'n', pointing to the right.



101

2E1

3E1

4E1

1C1

2C1

3D1

4E1

3C1

4C1

1B1

2B1

3B1

4B1

1A1

2A1

3A1

4A1

1B1

1A1

460 394

750 lbs. BASE CAPACITY
DO NOT EXCEED LIMIT

Do not modify
without prior safety
and engineering approval.

2176

1555





Autonomous Transport Robots



ELECTRIC CONVERSION

STANDARD CAR



3,300 lbs.



+600 lbs.

CARBON FIBER + INNOVATION



-750 lbs.



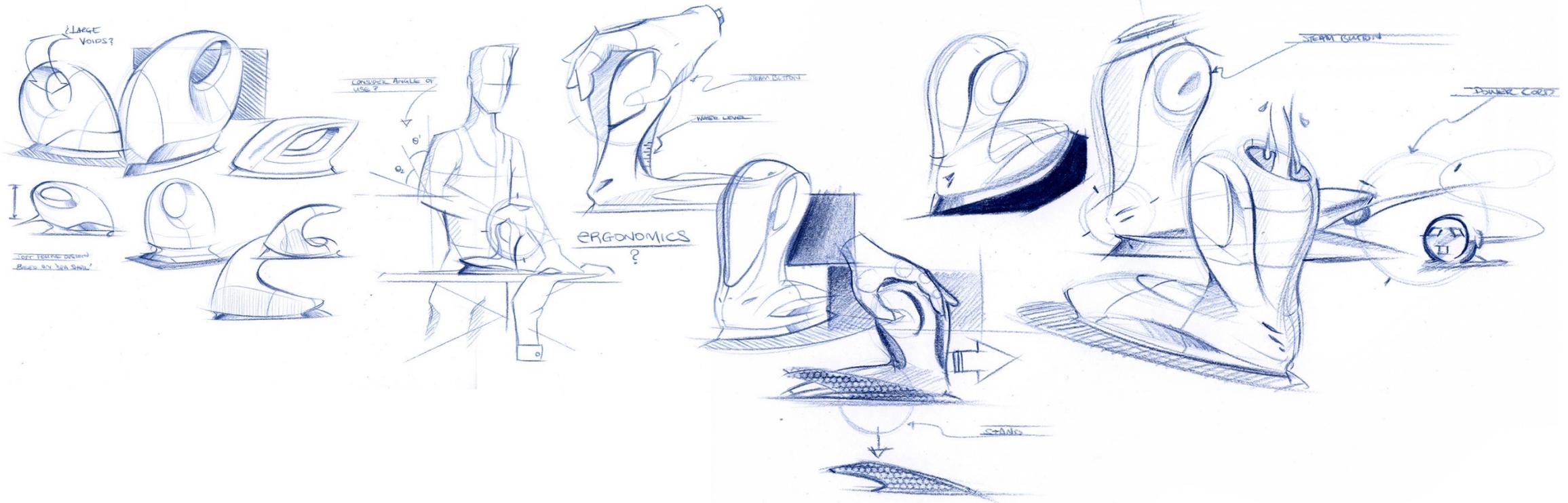
-450 lbs.
2,700 lbs.

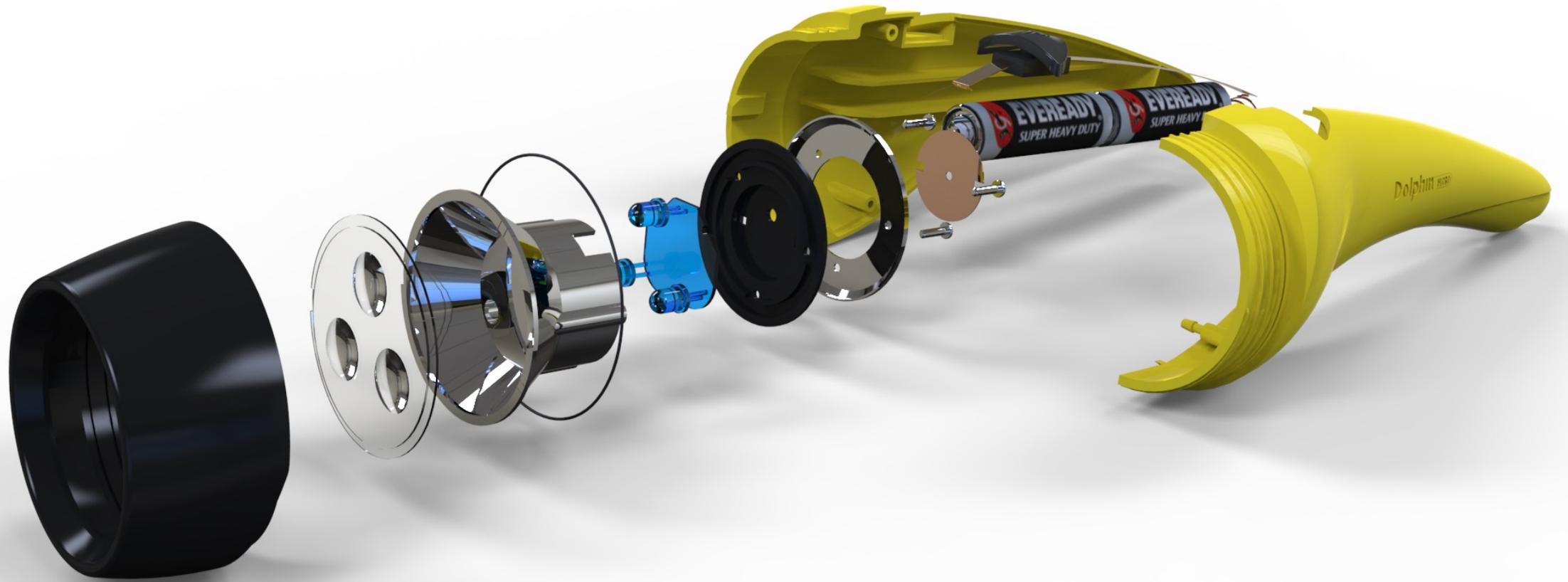




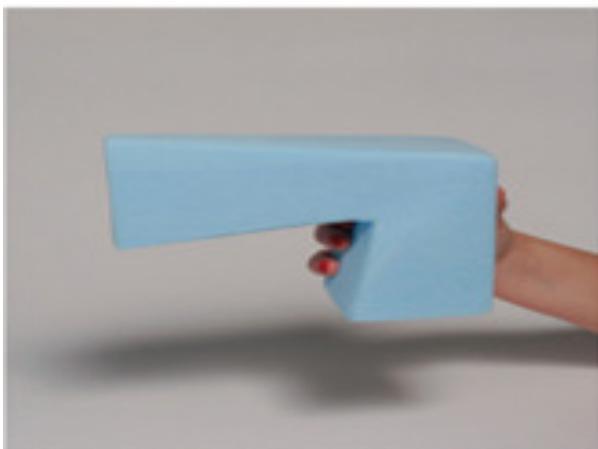
Will this mean jobs
will be lost?

















An example of distributed learning: 3D Prosthetic Foot

- Little 'formal' knowledge on the machine & material
- Blogs, YouTube, tacit knowledge of lecturers
- Portable file format
- Provides a low cost (approx. AUD\$15.00) prosthetic



Images courtesy of Jonathan Yap

An example of distributed learning: 3D Prosthetic Foot

- Students to become more entrepreneurial; creating their own brands
- No longer tethered to traditional manufacturers
- Can be more agile and respond to market influences, new technology and processes
- Are more engaged with the discipline



CENTRE FOR
DESIGN
INNOVATION

Give students REAL projects

A case study of Hong Kong 'nano-apartments'



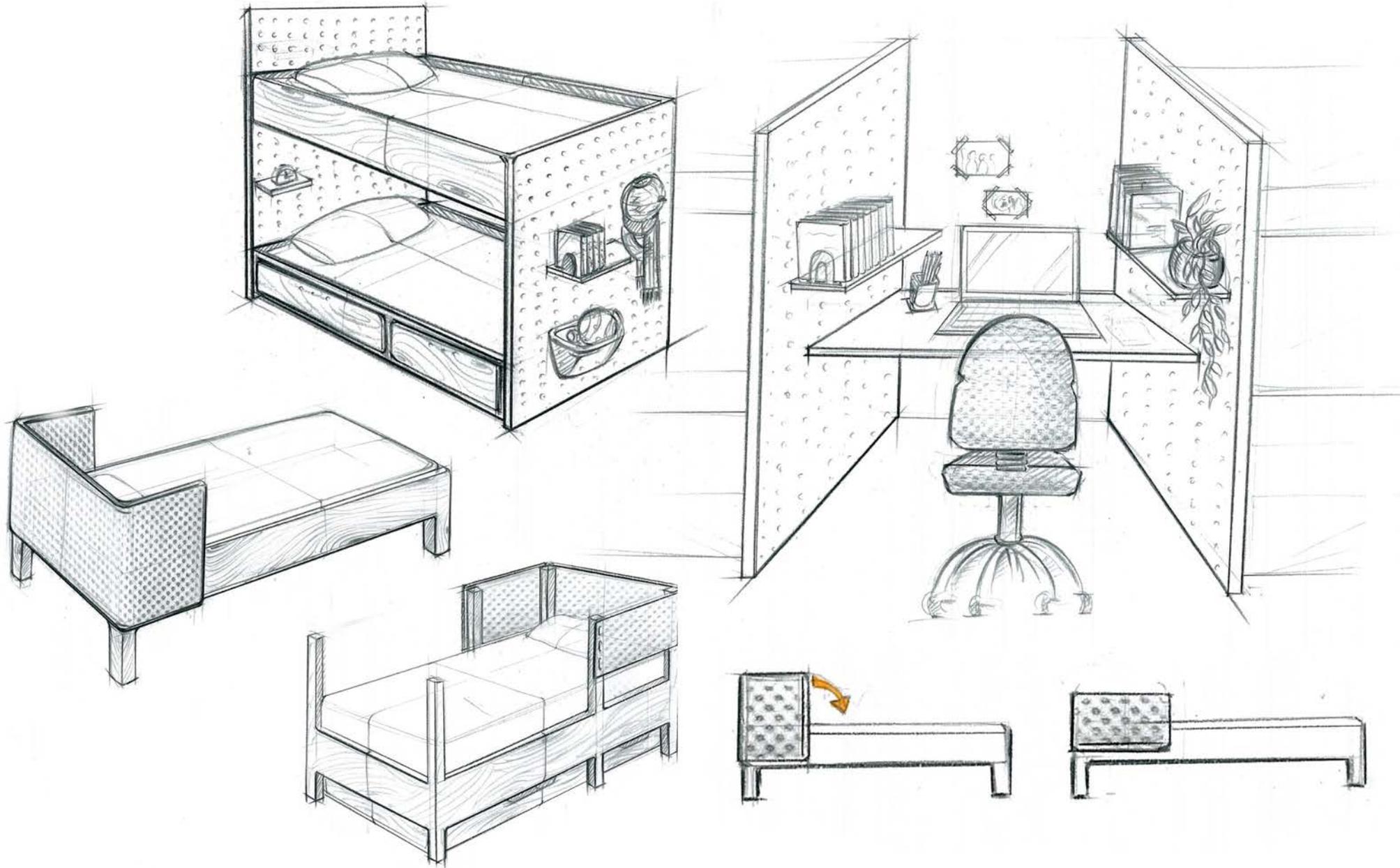














CONCEPT 1

Simple & classic



CONCEPT 2

Configurable & versatile



CONCEPT 3

Customisable & playful



CONCEPT 4

Convenient & comfortable

Prototype 1 – 1:1 scale evaluation

02/07/2021



ERGONOMIC EVALUATION

① Overall height to increase. This allows users to sit on the bed without the top crossbar obstructing their head.

② Upper support beam to reduce in width. This provides more head room when sitting on the bed and reduces material.

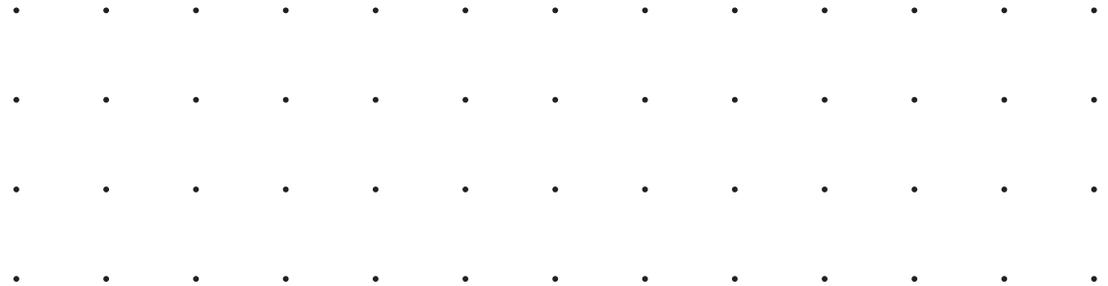
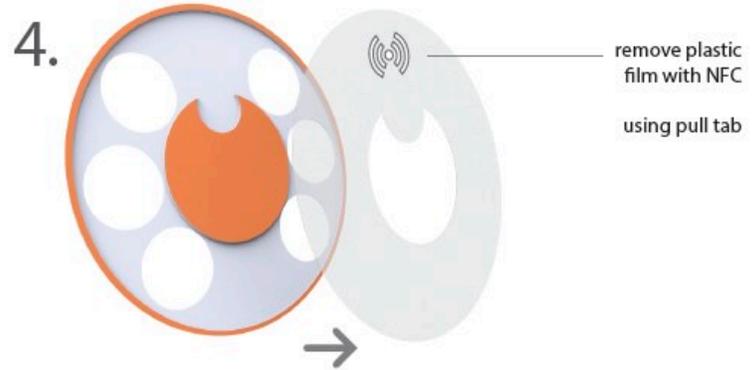
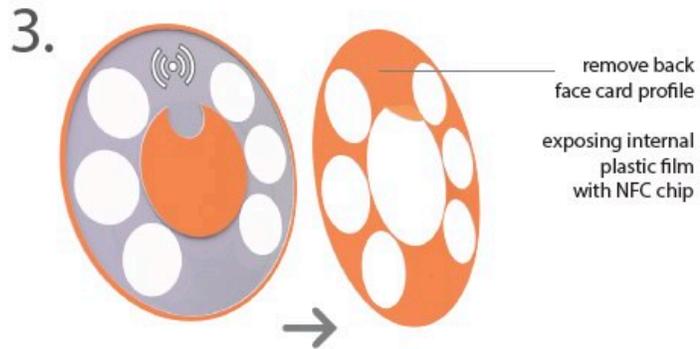
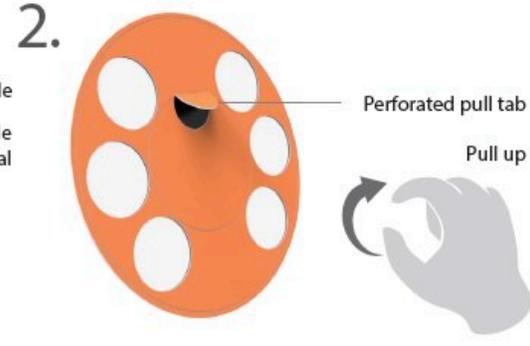
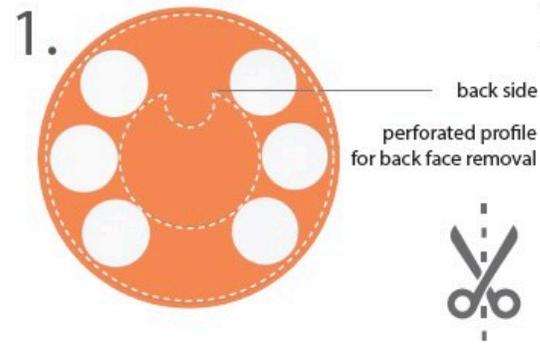
③ Privacy screens to extend to 1/3 the length of the bed. This allows greater privacy and a larger bedside table when folded out.

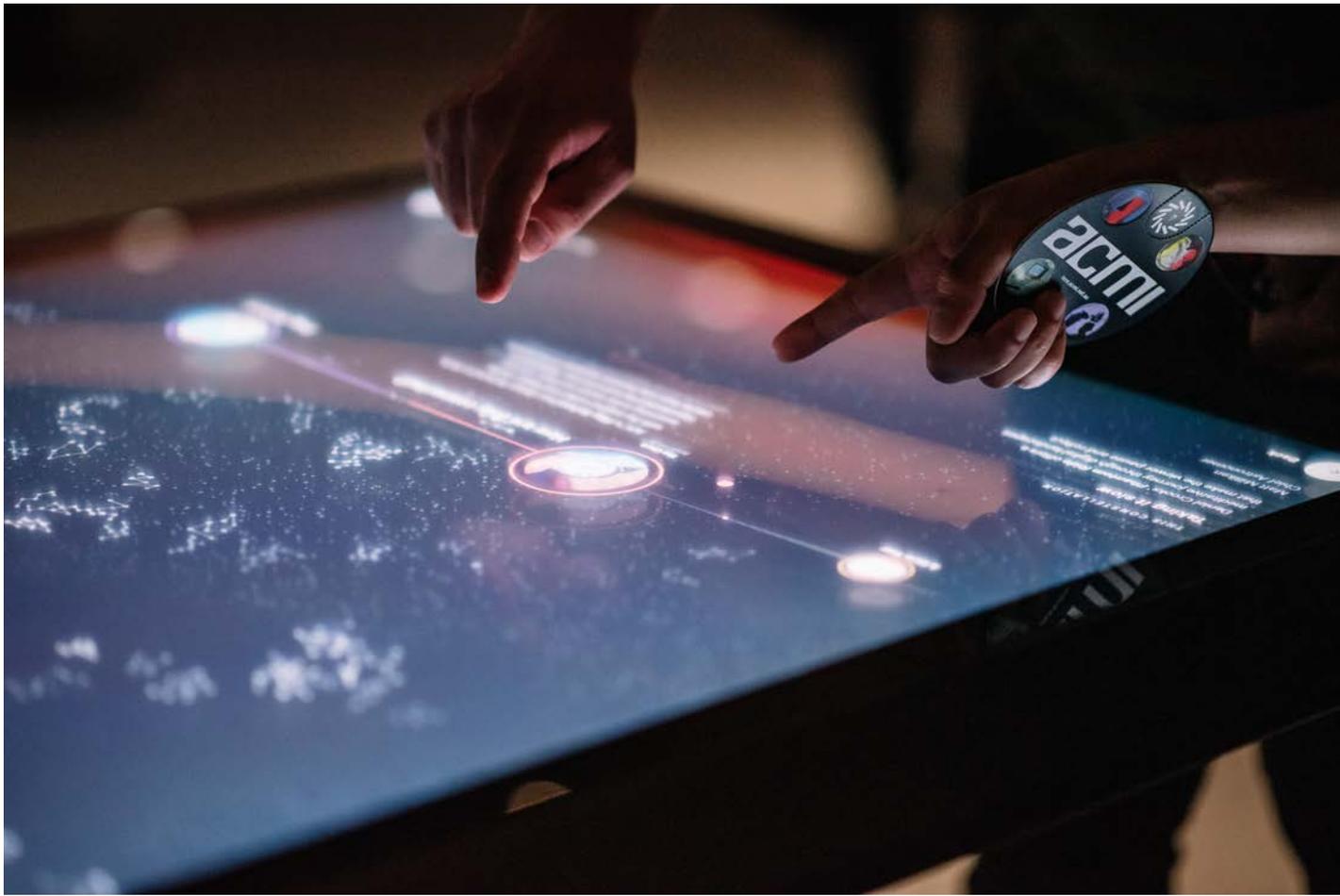
④ Base of bed to move down to allow greater storage and increase the height between the mattress and the upper support beam.

⑤ Lower storage to be divided into 3 sections instead of 4. This provides more practical storage solutions and maximises usability.



CONCEPT ONE

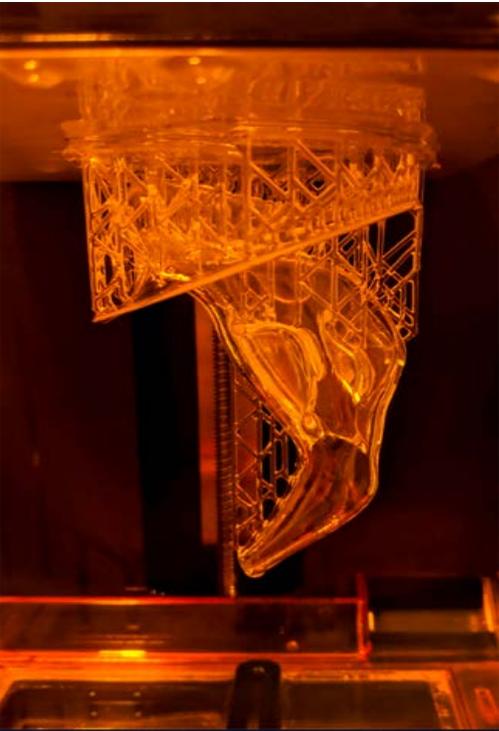




2 Million products
produced in 1-year







THANK YOU | Professor Blair Kuys | bkuys@swin.edu.au

