RESPONSIBLE DESIGN: RECOGNISING THE IMPACT OF HOW WE DESIGN

Prof. Steven Eppinger, MIT
Prof. Anja Maier, DTU

6. August 2019
22nd International Conference on Engineering Design (ICED19)
Delft, The Netherlands

THE WAY WE

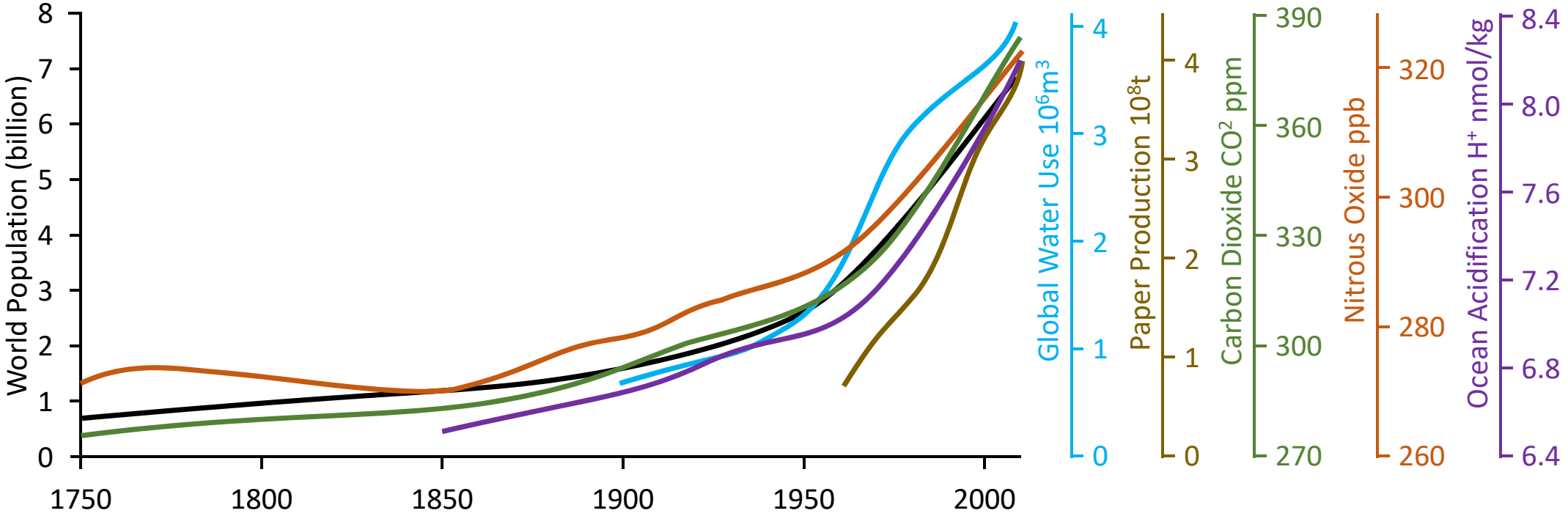
DESIGN

TODAY

CREATES THE WORLD WE WANT

TOMORROW.

Consumption has driven unprecedented planetary change.



Adapted from: WWF Living Planet Report, Grooten, M. and Almond, R.E.A.(Eds), 2018.

“Unless we act now, by 2050 our oceans will contain more plastics than fish”

World Economic Forum | Ellen McArthur Foundation

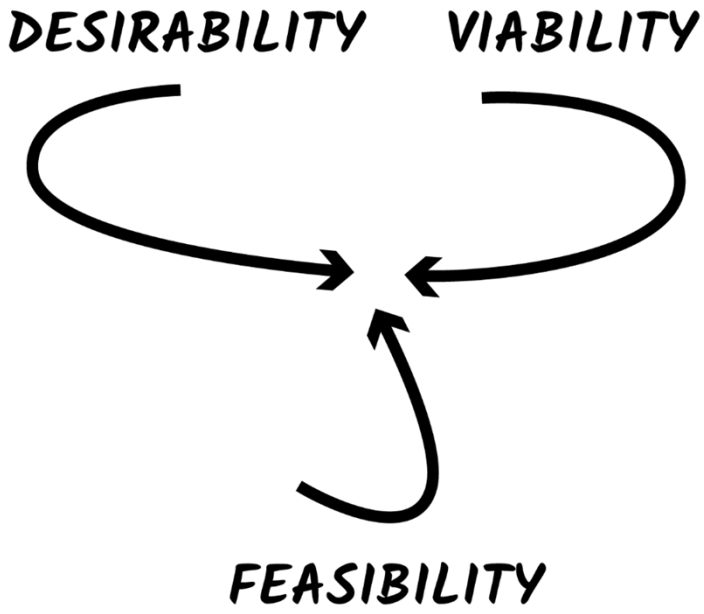
Photo: Shutterstock

We design, produce, purchase, use, dispose all this!

Photo: Unsplash

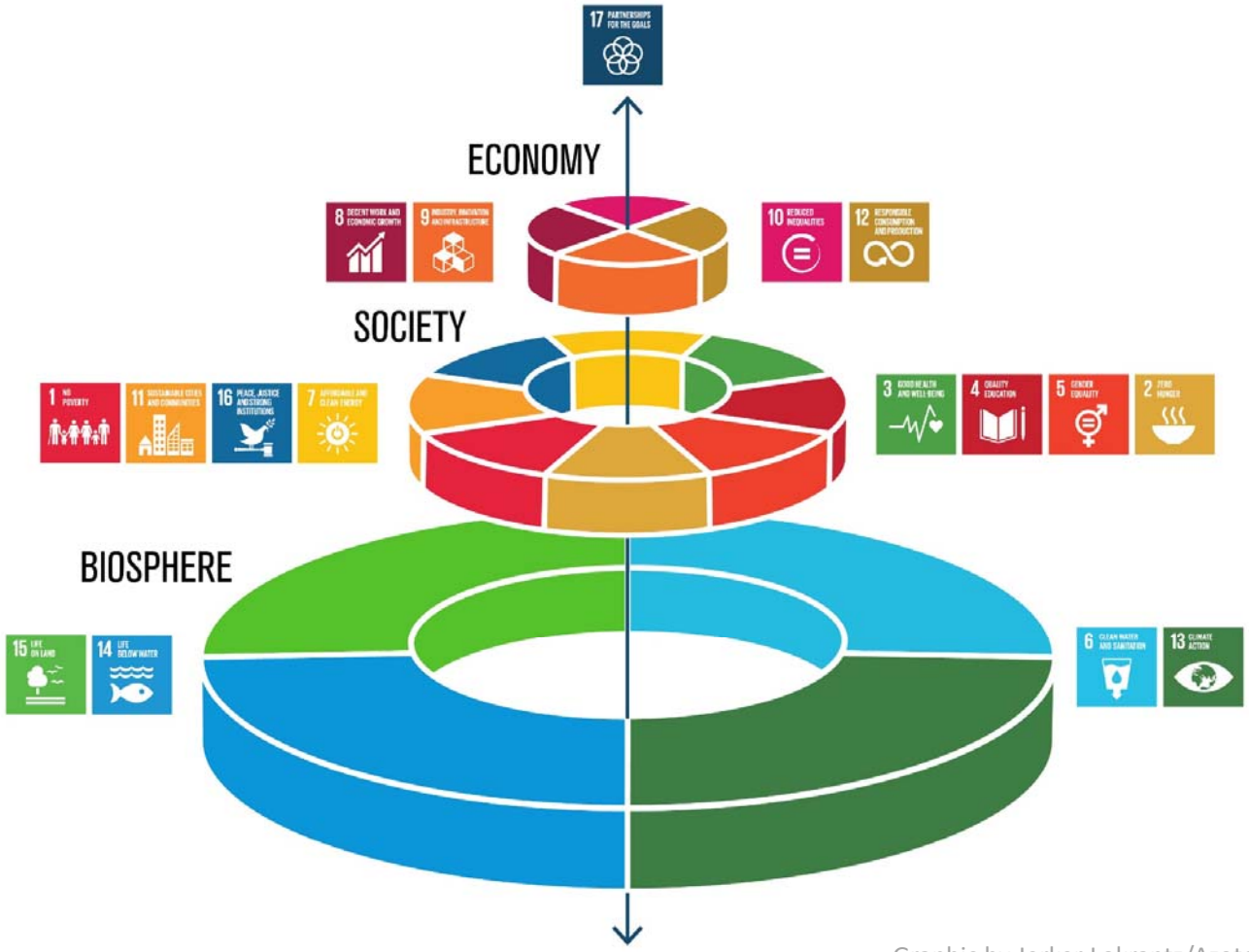
DEFINING RESPONSIBLE DESIGN

Traditional model for SUCCESSFUL DESIGN



reference: Brown, T. (2009): Change by design: How design thinking transforms organizations and inspires innovation (re-drawn image).

Nested model for SUSTAINABLE DEVELOPMENT

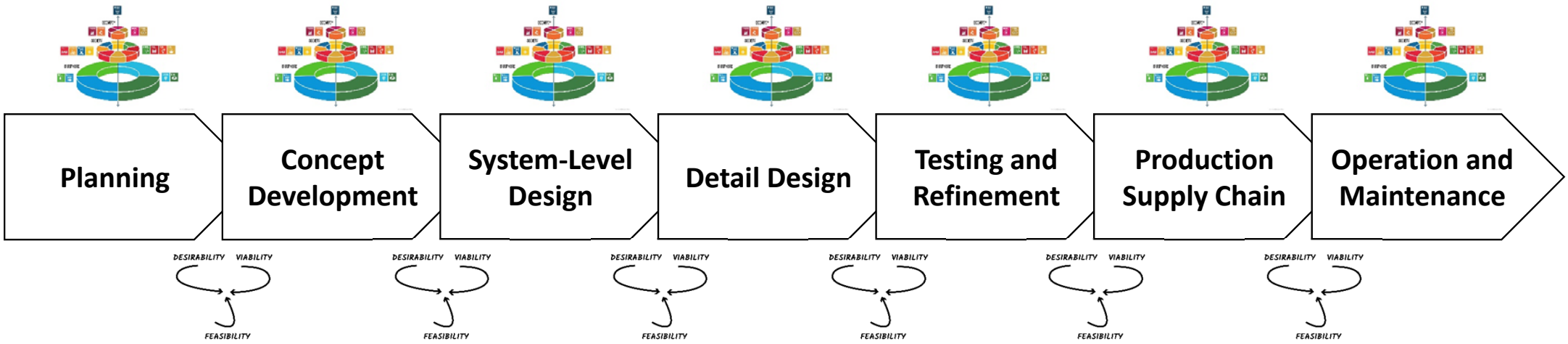


Graphic by Jerker Lokrantz/Azote

references:

Rockström, Stordalen, Horton (2016): Acting in the Anthropocene: the EAT–Lancet Commission. The Lancet 387: 2364 – 2365
Stockholm Resilience Center: https://www.stockholmresilience.org/.
United Nations: https://sustainabledevelopment.un.org/partnership/?p=11520.

Responsible Design requires a modification to the design process



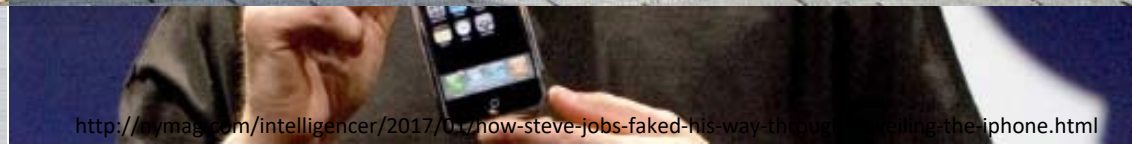
reference: Adapted from Ulrich, Eppinger, Yang: *Product Design and Development*. McGraw Hill.

Behaviour around designed artefacts

https://atlanta.curbed.com/2019/1/8/18173288/city-council-restrictions-bird-lime-shareable-e-scooters-last-mile.

www.bloomberg.com/news/articles/2018-05-04/how-smartphones-social-media-disrupt-childhood-quicktake.

https://www.qt.com.au/news/woman-in-hospital-after-being-hit-by-electric-scoo/3626369/



http://nymag.com/intelligencer/2017/01/how-steve-jobs-faked-his-way-through-unveiling-the-iphone.html

Systems perspectives, e.g. on e-mobility: re-designing transport, re-thinking behaviour needed

Image sources: Links in speaker notes.

DESIGNERS HAVE WHAT IT TAKES

- Envisioning the future
- Framing complex situations
- Asking the right questions
- Innovating to address trade-offs
- Creating desired behaviours
- Foreseeing social impacts
- Understanding environmental consequences
- Dealing with uncertainty
- Whole systems and lifecycle thinking

references:

e.g. Victor Papanek (1971): Designing for the real world. Human ecology and social change. Bantam Books.
e.g. Nynke Tromp and Paul Hekkert (2018): Design for Society: Products and Services for a Better World. Bloomsbury Visual Arts.

RESPONSIBLE

- Research and Innovation
- Innovation
- Investment
- Leadership
- …

references:

Responsible Research and Innovation, e.g.: European Commission (2012); Stilgoe, J. et al., (2013); Burget et al., (2017).
Responsible Innovation, e.g.: Owen, Bessant, Heintz (2013); Dreyer et al., (2017); Von Schomberg, R., and Hankins, J. (2019).
Responsible Investment, e.g.: Sparkes, (2008); https://www.investopedia.com/articles/mutualfund/03/030503.asp, (2018).
Responsible Leadership, e.g.: Bettignies, (2014); Clarke et al., (2018).

Responsible Research and Innovation

Responsible Research and Innovation means that **societal actors work together** during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs, and expectations of European society.

Choose together – **Engagement**
Unlock full potential – **Gender Equality**
Creative Learning Fresh Ideas – **Science Education**
'Do the right 'think' and do it right' – **Ethics**
Share the results to advance – **Open Access**
Design science for and with society – **Governance**

European Commission: https://ec.europa.eu/research/swafs/pdf/pub_public_engagement/responsible-research-and-innovation-leaflet_en.pdf (2012).

Responsible Innovation

"Responsible innovation means taking care of the future through collective stewardship of science and innovation in the present."

(Stilgoe et al., 2013: 1570)

Research Policy
Volume 42, Issue 9, November 2013, Pages 1568-1580

Developing a framework for responsible innovation

Jack Stilgoe [a], Richard Owen [b, 1], Phil Macnaghten [c, d]

Show more

https://doi.org/10.1016/j.respol.2013.05.008

Highlights

- The democratic governance of emerging science and innovation is a major challenge.
- We describe a framework for responsible innovation that addresses social and ethical concerns.
- The framework has four dimensions: anticipation, reflexivity, inclusion and responsiveness.

EPSRC
Engineering and Physical Sciences Research Council

Framework for Responsible Innovation

EPSRC is committed to develop and promote Responsible Innovation. This site reaffirms our own commitment and sets out our expectations for the researchers we fund and their research organisations.

Introduction

Responsible Innovation is a process that seeks to promote creativity and opportunities for science and innovation that are socially desirable and undertaken in the public interest. Responsible Innovation acknowledges, that innovation can raise questions and dilemmas, is often ambiguous in terms of purposes and motivations and unpredictable in terms of impacts, beneficial or otherwise. Responsible Innovation creates spaces and processes to explore these aspects of innovation in an open, inclusive and timely way. This is a collective responsibility, where funders, researchers, stakeholders and the public all have an important role to play. It includes, but goes beyond, considerations of risk and regulation, important though these are.

As a public funder of research, we have a responsibility to ensure that our activities and the research we fund, are aligned with the principles of Responsible Innovation, creating value for society in an ethical and responsible way. EPSRC does not wish to be prescriptive about how Responsible Innovation is embedded in the research and innovation process. We recognise that some researchers are already well engaged with this agenda. We also recognise that different approaches might be required for different research areas. There may be instances where detailed consideration is premature or even unwarranted. In other areas of research, a responsible innovation approach may be highly recommended, or even required. As such we recommend that all researchers demonstrate awareness of and commitment to, the principles of Responsible Innovation. Taking an approach that encompasses the following steps, should provide a flexible framework for researchers to use.

Anticipate, reflect, engage and act (AREA)

references: Stilgoe, J., Owen, R., and Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy, 42*, 1568–1580.
EPSRC Framework for Responsible Innovation: https://epsrc.ukri.org/index.cfm/research/framework/.
Von Schomberg, R., and Hankins, J. (2019): International Handbook on Responsible Innovation: A Global Resource. Edward Elgar Publishing.

Design Society speaks about Responsible Design

2019 Responsible Design Survey of Design Society members
(Administered by e-mail. Open between 10 May 2019 and 10 June 2019; n=128 participants)

There are many facets of Responsible Design

- Sustainable Development
- Sustainable Design
- Design for Sustainable Behaviour
- Design for Sustainability
- Design for Environment
- Environmentally conscious design
- Eco Design
- Circular Economy
- Life Cycle Engineering
- Frugal Innovation
- Social Product Development
- Socially Responsible Design
- Future Design
- Participatory Design
- Human-Centred Design
- Human-System Integration
- Design for Behaviour Change
- Social Impact Design

Sustainable Development + Social (Impact) Design

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
(Brundtland Report, 1987: Our Common Future). **Environmentally responsible**

Since the Brundtland Report, the concept of sustainable development has developed beyond the initial intergenerational framework to focus more on the goal of *"socially inclusive and environmentally sustainable economic growth".*
(Sachs, 2015: The Age of Sustainable Development). **Environmentally responsible** and **Socially responsible**

"[…] given the substantial ways that designed products and services shape societies, and the behaviour of the people in them, design outcomes may be the key to improving social dynamics and creating equitable social infrastructures. […] and raise the question: how can we anticipate the social consequences of products and services in order to drive societal progress."
(Hekkert and Tromp, 2019, p.20: Design for Society). **Responsible behaviour** and **Socially responsible**

Our definition of *Responsible Design* comprises three aspects

1. **Responsible behaviour** – Design that encourages people and organisations to interact with others in a respectful and sustainable manner.
2. **Environmentally responsible** – Design that meets the needs of the present without compromising the ability of future generations to meet their own needs.
3. **Socially responsible** – Design that enables better work conditions, healthy social interactions, and improvement of the human condition.

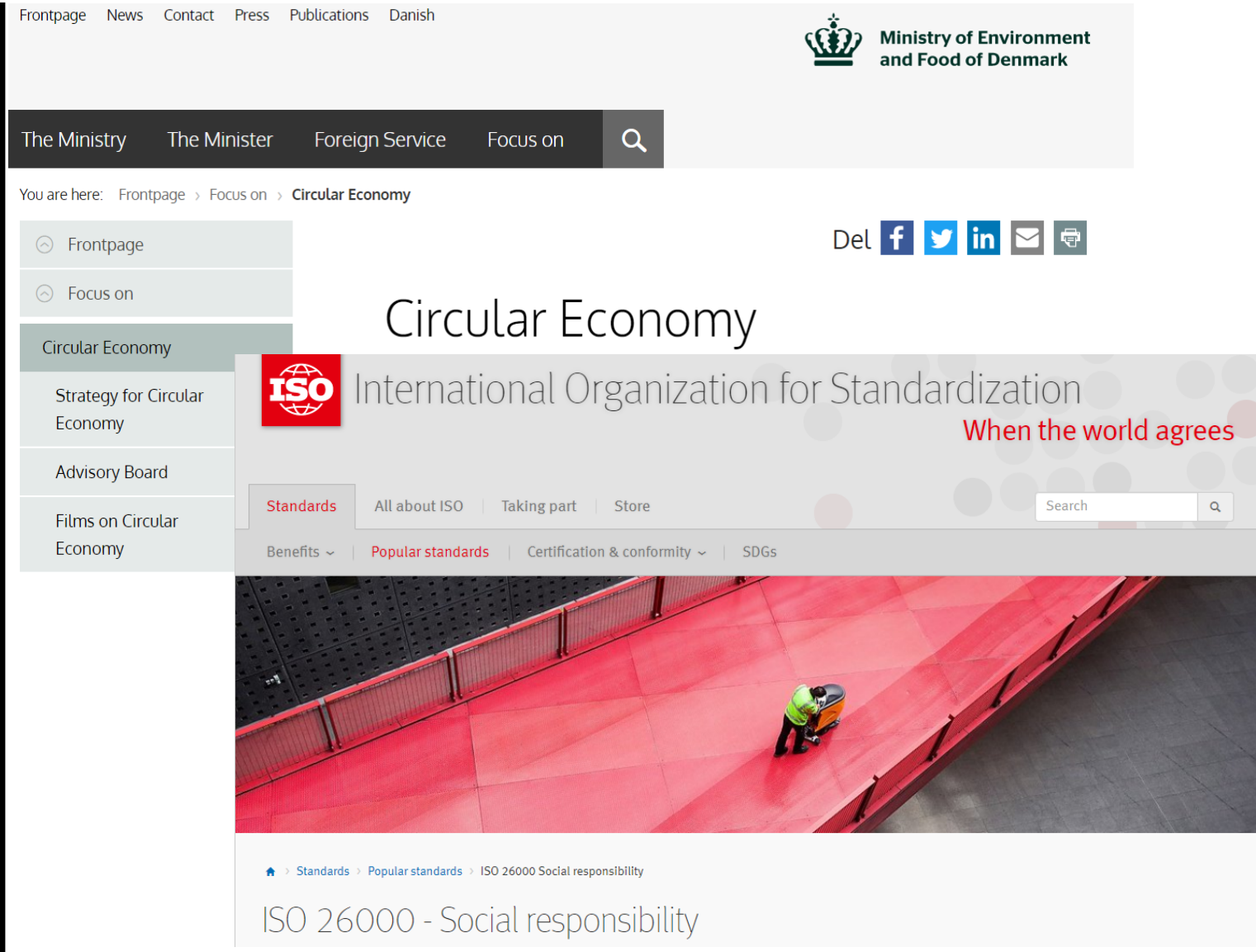
WHAT IS ALREADY BEING DONE

- on strategic-level, e.g. governmental, standards
- on tactical-level, e.g. businesses, cities
- on operational-level, e.g. grass-root initiatives, researchers, designers

STRATEGIC

e.g. governments

e.g. standards



references: https://eng.mst.dk/sustainability/sustainable-development-in-denmark/; https://en.mfvm.dk/focus-on/circular-economy/. https://www.iso.org/iso-26000-social-responsibility.html.

TACTICAL

e.g. LEGO

e.g. Novo Nordisk Circular for Zero

references:

LEGO: http://www.climateaction.org/news/lego-to-ban-plastic-blocks-by-2030.
LEGO: https://recyclenation.com/2015/07/lego-pledges-1-billion-to-build-more-sustainable-brick/.
Novo Nordisk: https://www.novonordisk.com/sustainable-business/zero-environmental-impact.html.
Novo Nordisk: https://www.jesperfrydenlund.com/project/novo-nordisk-circular-for-zero.

OPERATIONAL

e.g. grass root

e.g. researcher

e.g. designer

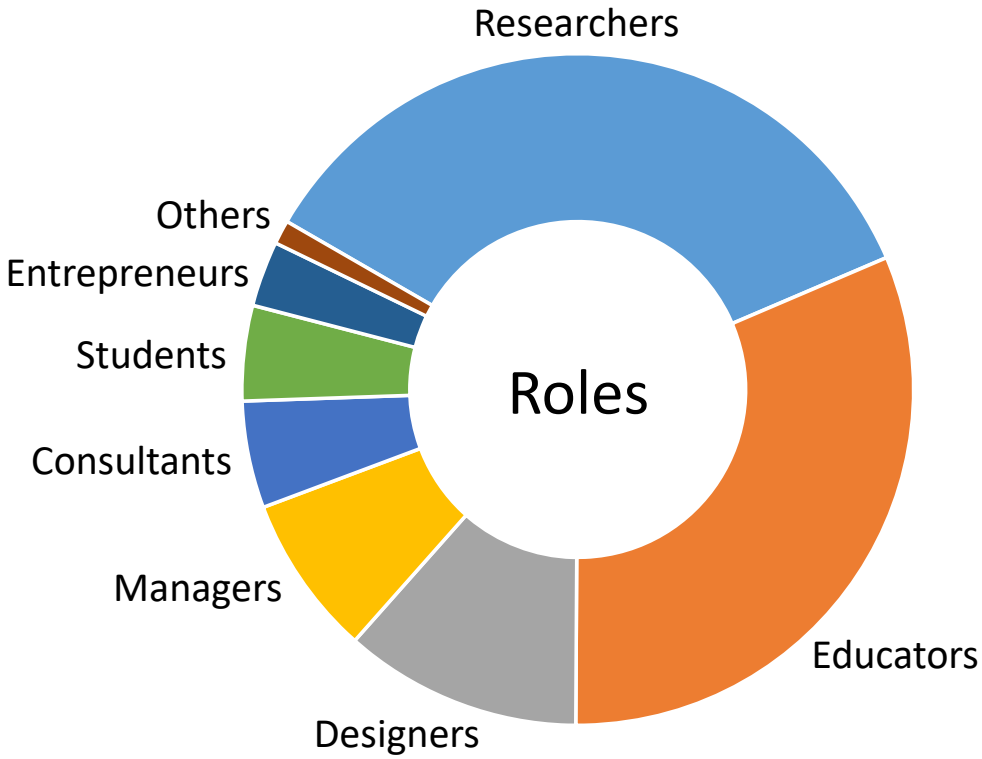
reference: https://www.incredibleedible.org.uk/.

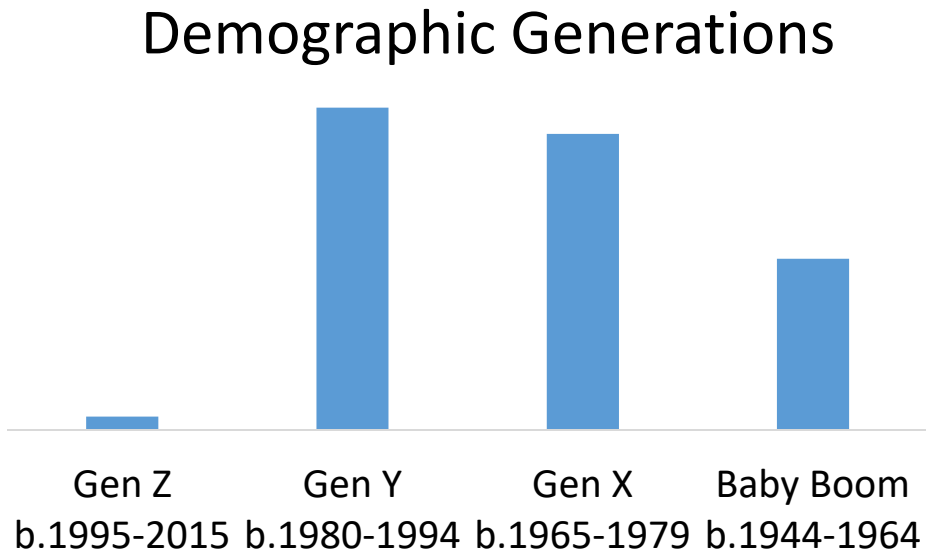
Responsible Design Survey sent to Design Society Members

Insights from the Survey Response, May - June 2019

Eppinger and Maier | ICED19

Survey Respondents: 128 Design Society Members (~18%)

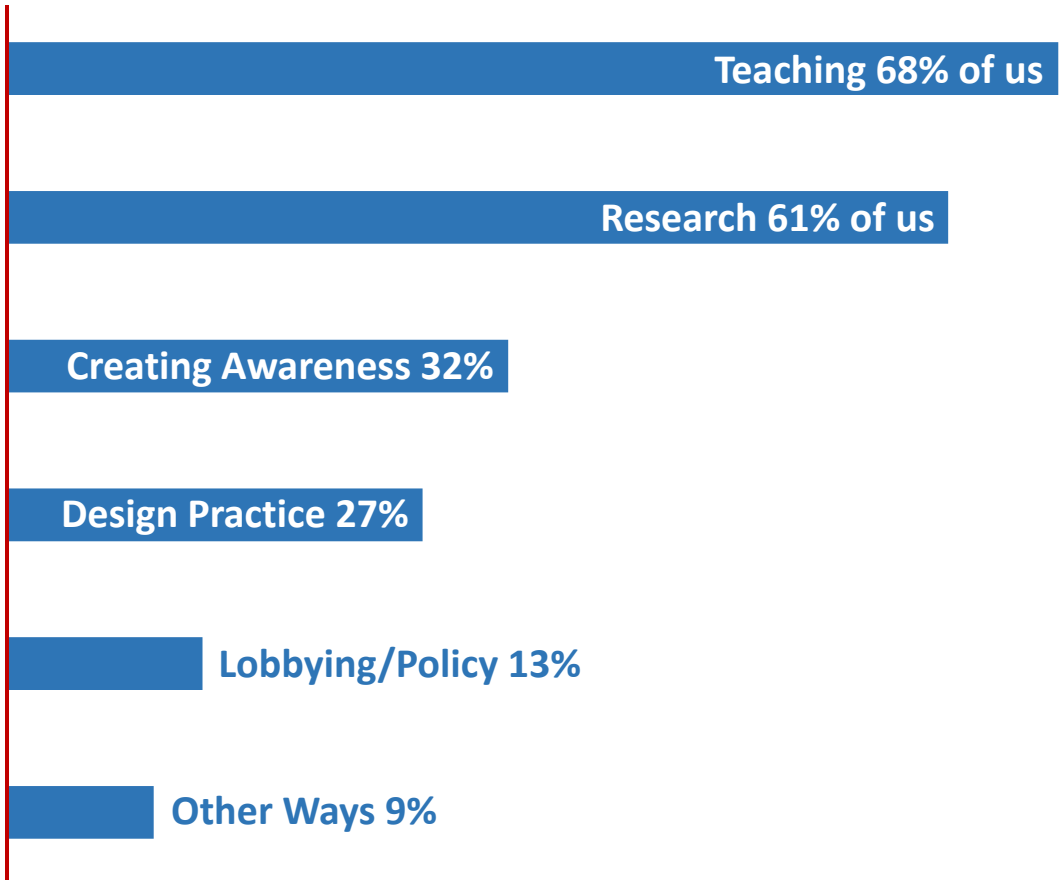




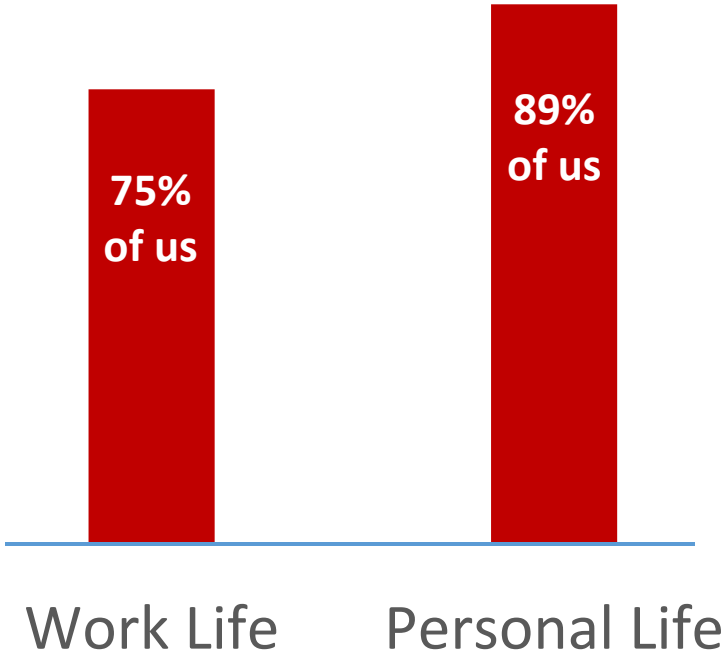
How we think about *Responsible Design*: What words come to mind?

Eppinger and Maier | ICED19

We are working on Responsible Design



We *think about* being responsible in our work and personal lives.



61% of us are aware of the UN SDGs

Top five areas of our **RESEARCH** are:

9. Industry, Innovation and Infrastructure
12. Responsible Production and Consumption
4. Quality Education
3. Good Health and Well-being
11. Sustainable Cities and Communities

Top five areas of our **TEACHING** are:

4. Quality Education
9. Industry, Innovation and Infrastructure
12. Responsible Production and Consumption
3. Good Health and Well-being
11. Sustainable Cities and Communities

Eppinger and Maier | ICED19

What we are

DOING

- Design Research
- Design Education
- Design Practice

TU Delft DESIGN FOR VALUES

Digital Ethics by Design – Executive Masterclass | DDfV for TU Delft Researchers

Design for Values | About DDfV | Research | Education | News/Events | Contact

Needed: Responsible Innovation

Responsible innovation is needed to address the grand challenges of the 21st century. It requires pro-actively addressing relevant moral and social values already in the design phase of new technologies, products, services, spaces, systems, and institutions. The Delft Design for Values (DDfV) Institute works on knowledge, methods and practices to do so.

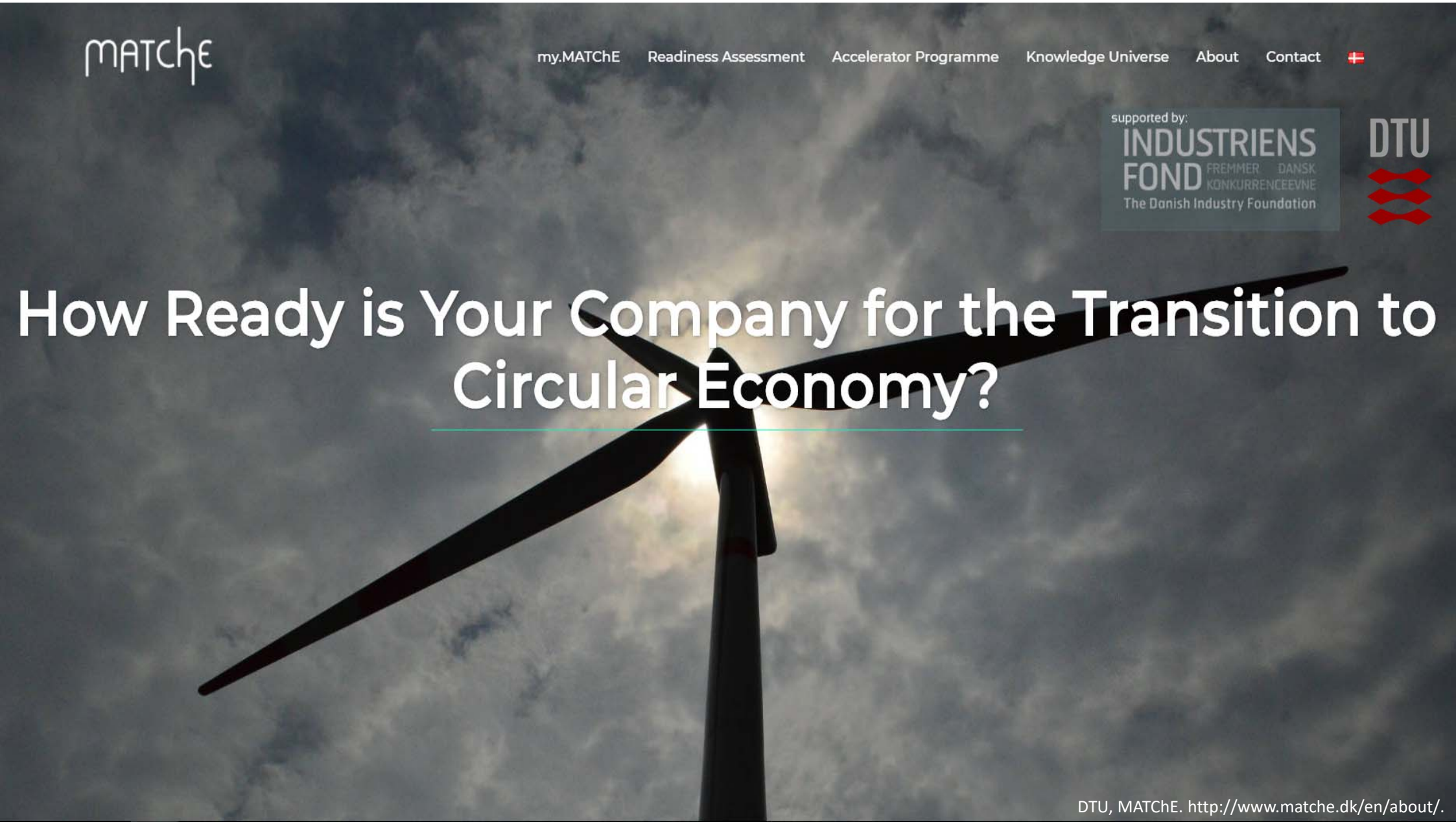
Why Design for Values?

There are several reasons for adopting a design for values approach: (1) the avoidance of technology rejection due to a mismatch with the values of users or society, (2) the improvement of technologies/design by better embodying these values, and (3) the generation or stimulation of values in users and society through design.

DDfV as Portal and Booster

The DDfV Institute serves as a portal and booster for Design for Values research, education, outreach and co-creation at Delft University of Technology. It aims at (1) making visible & accessible what TU Delft has to offer, (2) promoting internal & external collaborations, and (3) advancing knowledge, methods & best practices in the area of design for values.

TU Delft, Design for Values: http://designforvalues.tudelft.nl/.



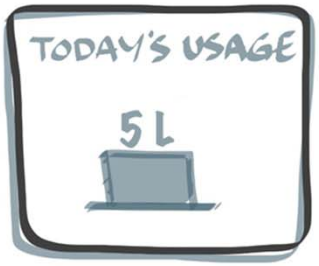
DTU, MATChE. http://www.matche.dk/en/about/.

Designing to Change User Behaviour – Eco-Feedback

Can products be designed to encourage more sustainable behaviour?

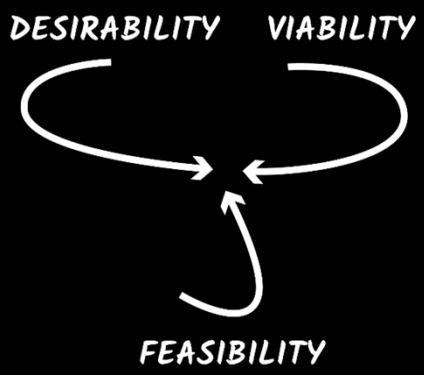
What role do emotions play in influencing product use behaviours?

Reamon Yu



MIT, Bao, Hughes, Burnell, & Yang, ASME JMD, 2018.

SUCCESSFUL Design



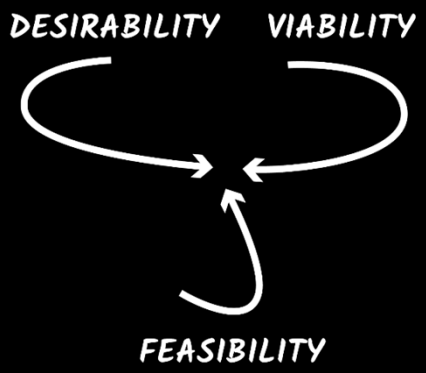
BRAUN

RESPONSIBLE Design

Environmental
Benefits

PHILIPS

SUCCESSFUL Design



Honeywell

RESPONSIBLE Design

Social Benefits
+
Responsible Behaviour
+
Environmental Benefits

nest
Learning Thermostat

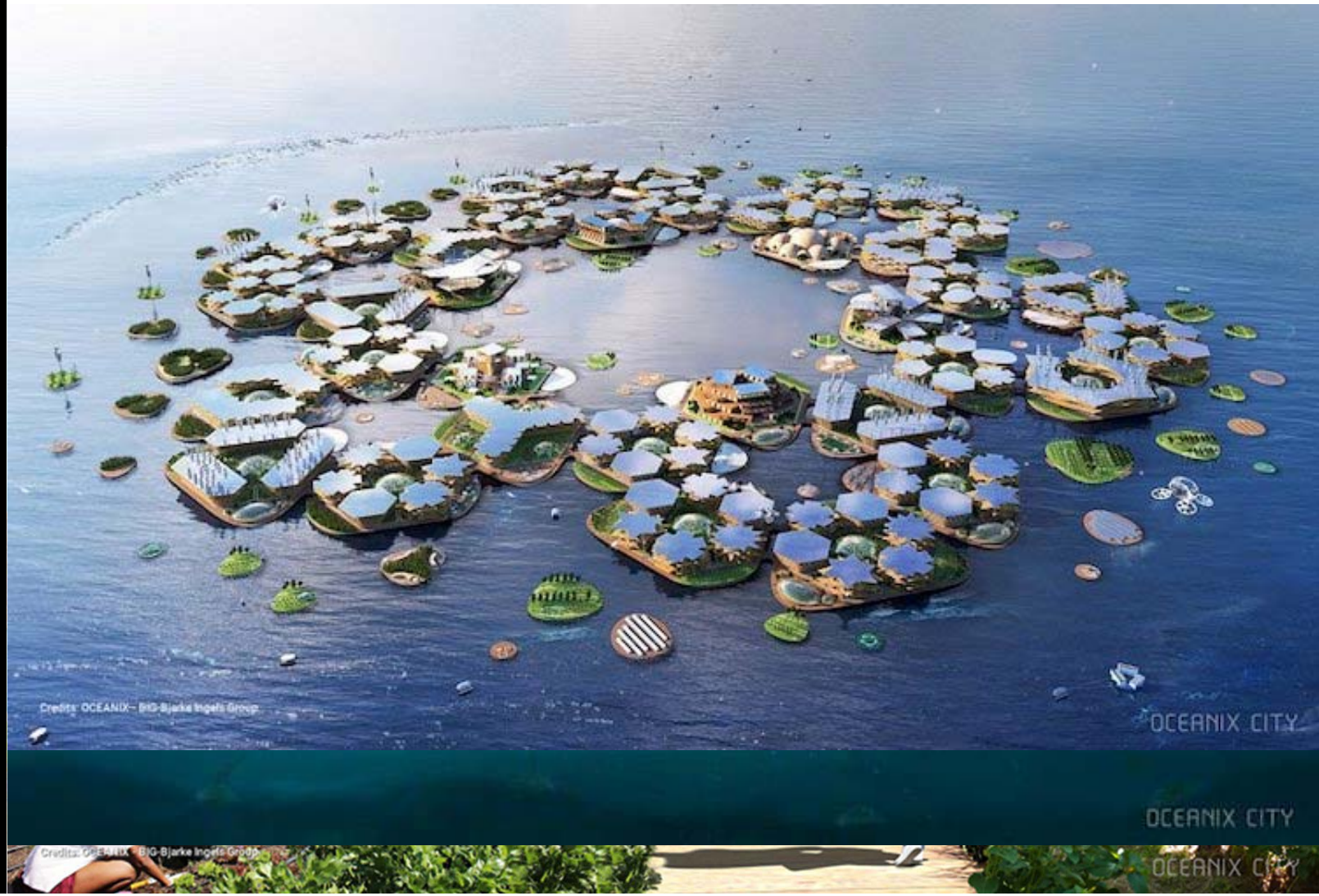
RESPONSIBLE Design

Social Benefits
+
Responsible Behaviour
+
Environmental Benefits

RESPONSIBLE Design

Social Benefits
+
Responsible Behaviour
+
Environmental Benefits

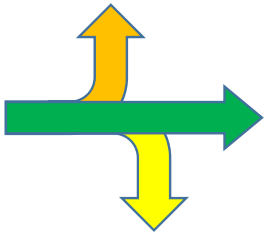
BIG
BJARKE INGELS GROUP



Call to ACTION

- Design Research
- Design Education
- Design Practice

Call to Action – Design Research



- Design- and systems thinking have already played a central role in several facets of responsible design
  - Lifecyle assessment, ecosystem dynamics, industrial symbiosis, sustainable design, behavioural design, …
- Many natural overlaps exist with adjacent fields of research
  - From cognitive science to ethics, environmental science to behavioural science, …
- Most researchers have tremendous latitude in which to apply our skills
  - We could choose to do more in this important direction

Call to Action – Design Education

- We are training the next generation of leaders now
  - Equip students with greater awareness and the right tools
  - Their future will be more responsible
- Teach to the tradeoffs
  - Go beyond the ”no regrets” easy examples
  - Solve fundamental tradeoffs with design skills
- SDGs offer “something for everyone”
  - The challenges are tremendous -- political, societal, environmental
  - We don’t yet know all of the solutions we will need

Call to Action – Design Practice

- Design for the world we want in the future
  - Inherently cleaner, safer, circular designs

- Design leaders make a difference
  - Establish goals for social and environmental benefits

- Rewards await!
  - Customers prefer products and services that are honest and sustainable (and help us act that way)

RESPONSIBLE DESIGN: RECOGNISING OUR INFLUENCE, OUR IMPACT, AND OUR ROLE

The world needs to change – and we can help.

We have the potential for much greater influence.

Awareness of the impact of our work is critical.

Please join us in taking on the challenge of responsible design.

RESPONSIBLE DESIGN: RECOGNISING THE IMPACT OF HOW WE DESIGN

- We all know that our industrial-age society must change to become more inclusive in sustainable growth.
- This job is too urgent - and too important - to be addressed by inept governments, dispassionate industry, and scattered organizations. We desperately need designers, engineers, and scientists to play vital roles.
- Today we are calling on Design Society - and on engineering designers worldwide - to take up the challenge of responsible design.
- Our survey of Design Society members shows that many of us have already started working in this area.
- Our young students are demanding we take action, and they deserve our redoubling of these efforts.
- Clearly we, as designers, have the skills and the influence necessary to make a difference. Please join us in spreading the word and increasing our positive, re-generative impact.

THANKING YOU

The Design Society
Responsible Design Survey Participants
Ameneh Fadaie
Agzam Idrissov
Andrea Bravo
Laura Sutcliffe
Monica Schofield
Ross Brisco
Tim McAloone

Slides available at zenodo.org

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RESOURCES

This list of resources collected and displayed on the pages following stems mostly from responses given to one of the questions in the Responsible Design Survey conducted for this keynote, leading up to ICED19. The survey was administered by e-mail to the Design Society members between 10.5.2019 and 10.6.2019. 128 people responded to the survey.

Pointers given by the respondents to the following question are listed overleaf:
"Are you aware of examples of effective responsible design research, teaching, or practice? If so, please share (name or link of) one or more examples. These will help us to share and promote compelling ideas in this important area".

Please contact us should you wish to receive the presentation slides from this keynote, inclusive of the responses to the above question from the survey respondents.

Pointers to research initiatives / research groups

2019 Responsible Design Survey among Design Society members
(Administered per e-mail. Open between 10. May 2019-10. June 2019; n=128 participants)

- Design for Values, TU Delft, The Netherlands. http://designforvalues.tudelft.nl/. Accessed on 29.6.2019.
- Center for Socially Engaged Design, University of Michigan, USA: https://csed.engin.umich.edu/. Accessed on 29.6.2019
- Sustainable Design Group, Loughborough University, UK: https://www.lboro.ac.uk/departments/design-school/research/sustainable-design/. Accessed on 29.6.2019.
- Design for Environment - Methods and Tools (Collaborative Research Center 392 (CRC 392), Darmstadt University of Technology, Germany: https://pdfs.semanticscholar.org/2494/6be82d955b77e619d8b274a4bb79b8299566.pdf. Design2004. Accessed on 29.6.2019
- Australian Urban Design Research Centre, Australia: https://www.audrc.org/. Accessed on 29.6.2019
- Torrens University: Here for Good. Australia. https://www.torrens.edu.au/here-for-good. Accessed on 29.6.2019.
- Chile, Ministry, Co-creation for the design of products for the elderly: http://www.senama.gob.cl/noticias/senama-biobio-participa-en-proyecto-de-co-creacion-de-productos-para-el-adulto-mayor. Accessed on 29.6.2019.

Pointers to research projects

2019 Responsible Design Survey among Design Society members
(Administered per e-mail. Open between 10. May 2019-10. June 2019; n=128 participants)

- DTU: http://www.ecodesign.dtu.dk/. Accessed on 29.6.2019.
- DTU: http://circitnord.com/. CIRCit: Circular Economy Integration in the Nordic Industry. Accessed on 29.6.2019.
- DTU: http://www.matche.dk/. MATChE: Supporting Danish industry effective transition towards Circular Economy. Accessed on 29.6.2019.
- DTU: http://www.loop-ports.eu/. LOOP-Ports: A circular economy network of ports. Accessed on 29.6.2019.
- DTU: http://www.amica-pathfinder.dk. AMICa: Advanced Mapping of Industrial Capabilities for Climate. Accessed on 29.6.2019.
- DTU: http://www.net-sights.dk: Net-Sights: Network Insights for Sustainable Production. Accessed on 29.6.2019.

Pointers to initiatives, networks, competition

2019 Responsible Design Survey among Design Society members
(Administered per e-mail. Open between 10. May 2019-10. June 2019; n=128 participants)

- Future Food: https://futurefood.network/about/. Accessed on 29.6.2019
- Sustainable Fashion, Ethics and Fair Trade Design: https://barbaraigongini.com/universe/blog/sustainable-fashion-design/. Accessed on 29.6.2019
- Ideasquare: https://ideasquare.web.cern.ch/. Accessed on 29.6.2019
- Global Goals Jam (GGS) with Digital Society School (DSS): https://globalgoalsjam.org/. Accessed on 29.6.2019
- UN, Sustainable Development Goals: https://www.un.org/sustainabledevelopment/sustainable-development-goals/. Accessed on 29.6.2019.
- TED-talk 2017 by DK Osseo Assare: What a scrapyard in Ghana can teach us about innovation. https://www.ted.com/talks/dk_osseo_asare_what_a_scrapyard_in_ghana_can_teach_us_about_innovation. Accessed on 29.6.2019
- Alibaba Tree Planting Initiative: https://pandaily.com/ant-forest-allowed-more-than-a-quarter-of-chinese-netizens-to-participate-in-charity-programs-through-the-mobile-internet/. Accessed on 29.6.2019.

Pointers to articles / working papers

2019 Responsible Design Survey among Design Society members (Administered per e-mail. Open between 10. May 2019-10. June 2019; n=128 participants)

- Kjær, L. L., Pigosso, D. C. A., McAloone, T. C., & Birkved, M. (2018). Guidelines for evaluating the environmental performance of Product/Service-Systems through life cycle assessment. *Journal of Cleaner Production*, *190*, 666-678. https://doi.org/10.1016/j.jclepro.2018.04.108
- Moultrie, J., Sutcliffe, L. F. R., & Maier, A. (2016). A Maturity Grid Assessment Tool for Environmentally Conscious Design in the Medical Device Industry. *Journal of Cleaner Production*, *122*, 252–265. https://doi.org/10.1016/j.jclepro.2015.10.108
- Moultrie, J., Sutcliffe, L., & Maier, A. (2015). Exploratory Study of the State of Environmentally Conscious Design in the Medical Device Industry. *Journal of Cleaner Production*, *108*(Part A), 363–376. https://doi.org/10.1016/j.jclepro.2015.06.014
- Thierry Godjo, Jean-François Boujut, Claude Marouzé, François Giroux (2015): *A participatory design approach based on the use of scenarios for improving local design methods in developing countries*. Working paper. 2015. hal-01206430v2. Available from: https://www.researchgate.net/publication/282569727_A_participatory_design_approach_based_on_the_use_of_scenarios_for_improving_local_design_methods_in_developing_countries [accessed Jun 30 2019].
- Yoram Reich, Suresh L. Konda, Ira A. Monarch, Sean N. Levy, Eswaran Subrahmanian (1996): Varieties and issues of participation and design, Design Studies, Volume 17, Issue 2, 1996, Pages 165-180, ISSN 0142-694X, https://doi.org/10.1016/0142-694X(95)00000-H. https://www.sciencedirect.com/science/article/pii/0142694X9500000H
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Pointers to proceedings and journals

2019 Responsible Design Survey among Design Society members
(Administered per e-mail. Open between 10. May 2019-10. June 2019; n=128 participants)

- Canadian Engineering Education Association: https://ceea.ca/en/publications/. Accessed on 29.6.2019.
- International Conference on Engineering and Product Design Education (E&PDE) conference series. Search library, open publications on website of Design Society: www.designsociety.org
- ICED17 Conference theme: Resource-sensitive design. www.iced17.org
- ICED19 Conference theme: Responsible design. www.iced19.org
- Design Science Journal: https://designsciencejournal.designsociety.org/

Pointers to books

2019 Responsible Design Survey among Design Society members
(Administered per e-mail. Open between 10. May 2019-10. June 2019; n=128 participants)

- Victor Papanek, *Design for the Real World: Human Ecology and Social Change* (New York: Pantheon Books, 1971)
- Fukuda, Suichi (2019): Self Engineering: Learning from Failures. https://www.springer.com/gp/book/9783030267247. Accessed on 29.6.2019.
- Vajna, Sandor (2014): Integrated Design Engineering. https://link.springer.com/book/10.1007/978-3-642-41104-5. Accessed on 29.6.2019.
- Eswaran Subrahmanian, Toluwalogo Odumosu, Jeffrey Y. Tsao (2018): Engineering a Better Future: Interplay between Engineering, Social Sciences, and Innovation. https://link.springer.com/book/10.1007/978-3-319-91134-2. Accessed on 30.6.2019.
- John Clarkson, Roger Coleman, Simeon Keates, Cherie Lebbon (2002): *Inclusive Design: Design for the Whole Population* (Berlin: Springer).
- Tromp, Nynke and Paul Hekkert (2019): Designing for Society: Products and Services for a Better World. Bloomsbury.
- Niedderer, K., Clune, S., and G. Ludden (Eds) (2018): Design for Behaviour Change: Theories and Practices of Designing for Change. In Series: Design for Social Responsibility. Series Editor Rachel Cooper. Gower. Routledge.
- Tracy Bhamra and Vicky Lofthouse (2007): Design for Sustainability: A Practical Approach. In Series: Design for Social Responsibility. Series Editor Rachel Cooper. Gower. Routledge.

Pointers to courses / programmes

2019 Responsible Design Survey among Design Society members
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- Let's RE(D)USE, TU Delft, The Netherlands: https://www.tudelft.nl/en/ide/research/research-themes/lets-reduse/. Accessed on 29.6.2019
- Integrated Design Engineering, https://www.ide.ovgu.de/, University of Magdeburg, Germany: https://www.ide.ovgu.de/, Accessed on 29.6.2019.
- MIT D-Lab; Professional education course; Designing for a more equitable world, USA: https://d-lab.mit.edu/, Accessed on 29.6.2019.
- DTU: http://kurser.dtu.dk/course/2019-2020/41051. Product life and environmental issues. Accessed on 29.6.2019.
- DTU: http://kurser.dtu.dk/course/2019-2020/42340. Sustainability in engineering solutions. Accessed on 29.6.2019.
- DTU: http://kurser.dtu.dk/course/2019-2020/42090. Holistic Design of Engineering Systems. Accessed on 29.6.2019.
- DTU: http://kurser.dtu.dk/course/2019-2020/41073. Development and operation of product/service-systems. Accessed on 29.6.2019.

Pointers to tools

2019 Responsible Design Survey among Design Society members
(Administered per e-mail. Open between 10. May 2019-10. June 2019; n=128 participants)

- The flourishing business model canvas by Flourishing Enterprise Innovation: Tools for the Strongly Sustainable Revolution – Financially Rewarding, Socially Beneficial, Environmentally Regenerative. https://www.ted.com/talks/dk_osseo_asare_what_a_scrapyard_in_ghana_can_teach_us_about_innovation. Accessed on 29.6.2019
- Resources for teachers to integrate sustainability into their classes. Toolkit for various aspects of sustainable design. https://venturewell.org/tools_for_design. Accessed on 29.6.2019
- Eco-design, materials choice: http://ecopem.univ-valenciennes.fr/. Accessed on 30.6.2019.
- Codes and Safety. Aalto University, Finland: https://mycourses.aalto.fi/pluginfile.php/880281/mod_folder/content/0/3-%202018%20Otto%20Codes%20and%20Safety%20v1-190118.pdf?forcedownload. Accessed on 30.6.2019
- IDEO: The Circular Design Guide: https://www.circulardesignguide.com/. Accessed on 7.7.2019.

Pointers to products / spaces

2019 Responsible Design Survey among Design Society members
(Administered per e-mail. Open between 10. May 2019-10. June 2019; n=128 participants)

- Evian – Water jugs that shrink when you drink. https://www.fastcompany.com/90334383/evians-new-plastic-water-jugs-shrink-as-you-drink-the-water. Accessed on 30.6.2019
- Oodi – Helsinki Central Library. Living space for residents. https://www.oodihelsinki.fi/en/. Accessed on 30.6.2019

Slides available at zenodo.org

RESPONSIBLE DESIGN: RECOGNISING THE IMPACT OF HOW WE DESIGN

Prof. Steven Eppinger, MIT
Prof. Anja Maier, DTU

6. August 2019
22nd International Conference on Engineering Design (ICED19)
Delft, The Netherlands