RSA

Action and Research Centre

Unlocking the creative potential of 21st century industry

Creating the conditions for design to flourish in UK business

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About the RSA

The RSA (Royal Society for the encouragement of Arts, Manufactures and Commerce) believes that everyone should have the freedom and power to turn their ideas into reality. Through our ideas, research and 29,000-strong Fellowship, we seek to realise a society where creative power is distributed, where concentrations of power are confronted, and where creative values are nurtured. The RSA Development team seeks to grow the reach and impact of the RSA by developing strategic partnerships with a range of organisations and delivering rigorous action-research programmes.

Recent RSA studies have explored the rise in self-employment, the nature of the gig economy, and the drivers behind the informal economy. In each case, we have sought to dig behind the headlines, unpick the nuance of debates, and canvass views from across the political spectrum. Our goal is to explore the big challenges facing society today.

About Innovate UK

Innovate UK, part of UK Research and Innovation, is the UK's innovation agency. Innovate UK drives productivity and growth by supporting businesses to realise the potential of new technologies, develop ideas and make them a commercial success. Our vision is to see the UK as a global leader in innovation and a magnet for high growth, innovative companies, where new technology is applied rapidly and effectively to create wealth. We're an organisation of around 300 staff, drawn mainly from business. We work across the UK, with a head office in Swindon. With a strong business focus, we drive growth by working with companies to de-risk, enable and support innovation. Since 2007 we have committed over £1.8bn to innovation, matched by a similar amount in partner and business funding. We have helped 8,000 organisations with projects estimated to add more than £16bn to the UK economy and create nearly 70,000 jobs. Innovate UK are a key player in pushing the agenda of design within UK businesses, championing the importance of its role in economic growth. In 2015, Innovate UK published their Design in Innovation strategy with a clear aim to make "UK businesses innovate better, grow faster and achieve greater commercial success through the effective use of excellent early-stage design."[1]

1. Innovate UK (2015) Design in Innovation Strategy 2015-2019. [pdf] Available at: www.legco.gov.hk/general/english/library/stay_informed_overseas_policy_updates/design_in_innovation_strategy.pdf.

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Summary

Design in 21st century industry

The importance of design to the UK economy has reached a tipping point in recent years. As the data around the impact of design is more accurately measured and reported, including gross value added, productivity and exports, both the practise and theory of design have been elevated to new levels of importance. Even public discourse now regularly references design thinking and the application of design methods, and processes in everything from teaching to policymaking to technology.

The UK government's 2017 Industrial Strategy Green Paper sets the objective of "improving… economic growth by increasing productivity and driving growth across the UK".[2] In 2013, the design economy generated £71.7bn in gross value added (GVA), equivalent to 7.2 percent of UK total GVA.[3] In light of these statistics, there appears a clear incentive to focus on the next phase of embedding design into UK industry and overcome barriers to its wider adoption.

Design has the capacity to further unlock the creative potential of UK industry in the journey toward innovation and growth. The UK has a pedigree of industrial innovation, but design continues to confuse many businesses, leaving many without a clear understanding of what it is. This comes from the fact that 'design' itself is a broad church with many different disciplines, applications and benefits. While we don't seek to artificially narrow the scope of designers in this paper, we do intend to help industry navigate the field of design, look at how to encourage excellence in design and understand how it can be applied in their domains.

This paper seeks to better understand the challenges and opportunities presented by design, explore new design applications and create a clearer vision for what a successful design-led future would look like. It covers the current use of design by industry, and the effect that it has on industry performance and the broader economy. It looks at opportunities for greater application of design, particularly those arising from shifts in the economy entailed by the

2. HM Government (2017) Building our Industrial Strategy (January 2017 Green Paper). [pdf] Available at: beisgovuk.citizenspace.com/strategy/industrial-strategy/supporting_documents/buildingourindustrialstrategygreenpaper.pdf.

3. Design Council (2015) The Design Economy: Tbe value of design to the UK. [pdf] Available at: www.designcouncil.org.uk/sites/default/files/asset/document/Design percent20Economy percent20report percent20web percent20Final percent20- percent20140217 percent20Yea percent201.pdf.

so-called 'fourth industrial revolution', as well as what conditions best enable design to flourish and how they can be fostered.

Together with Innovate UK, we aim here to build on previous studies that have explored the role and value of design in industry. We also want to stimulate an open debate about how best to facilitate the broader adoption of design in industry. We aim to understand what practical interventions can be put in place, as well as what networks can be galvanised to elevate the importance of design to UK industry. To this end, we set out seven recommendations and challenges to industry, education and government to support wider adoption of design as follows:

1. **Embed design into existing support and research provision for businesses wherever they sit on the 'design ladder'**

2. **Ensure that design support is accessible at a local level**

3. **Share relevant research and insights between sectors**

4. **Apply design to solving the Industrial Strategy Grand Challenges**

5. **Ensure that design is discussed in a more open and accessible way**

6. **Reduce perceived risk in investing in design**

7. **Invest in broad design education that brings together design and business**

This paper is based on the following research:

- Desk-based review of relevant literature;
- A series of structured interviews with design and business leaders;
- An expert roundtable that brought together designers, investors, entrepreneurs and industrialists to consider and develop findings;
- Two public lectures as part of the RSA's Public Events programme focused on the role and value of design in industry.

Introduction

Industry 4.0

It is a truism to say we live in a time of change, unprecedented in its breadth and pace. Klaus Schwab, the founder of the World Economic Forum, captured the idea in his influential 2017 book, The Fourth Industrial Revolution. The first industrial revolution, powered by steam, marked a shift from mechanisms driven by the sweat of people and animals to the use of fossil fuels to power machinery. The second industrial revolution, occurring at the end of the 19th and early 20th century, crossed national boundaries, and deployed electricity for mass production of consumer goods. The third, starting the 1950s, has become genuinely global, with the growing ubiquity of the micro-processor leading to an explosion in information technology.[4]

According to Schwab, we are now on the cusp of the fourth industrial revolution, fundamentally different in its scope, driven by rapid innovation and technological change as the worlds of the physical, digital and biological are fused together into 'cyber-physical systems'. Like the ones before, its impacts are predicted to sweep beyond industrial process into wider social change. The fourth industrial revolution, 'Industry 4.0', is driven by the development of new technologies, from nanotech to biotech, big data, digital health technologies, the digitisation of matter itself (allowing 3D printing and bio-printing of new organic matter), the internet of things, blockchain, and the wearable internet.[5]

This industrial revolution is anticipated to be driven by more rapid innovation and technological change. Technologies new and old will become more embedded within our daily lives, and even change the nature of the human body.[6] These rapid and profound disruptions to society and the economy create new opportunities for businesses to not only respond to, but also crucially to drive change. Design, with its emphasis on human-centred solutions, is core to an industrial ambition to innovate to meet changing needs and consumer demands.

Looking forward to 2050, the government's Foresight study on the future of manufacturing identified four major trends:

4. Schwab, K. (2017) *The Fourth Industrial Revolution*. New York: Crown Business.
5. Montresor, F. (2016) The Seven Technologies Changing Your World. Geneva: WEF. [online] Available at: www.weforum.org/agenda/2016/01/a-brief-guide-to-the-technologies-changing-world.
6. WEF (2016) *The Fourth Industrial Revolution*, by Klaus Schwab. Geneva: World Economic Forum. [online] Available at: www.weforum.org/about/the-fourth-industrial-revolution-by-klaus-schwab.

1. **Manufacturing will become faster, more responsive to market shifts and closer to customers**. Factories of the future will become more flexible, integrating local production with global supply chains. With opportunities for low cost, mass personalisation now in sight, Foresight see the UK as well placed to benefit from the higher margins, good jobs, and product leadership that will result.
2. **New market opportunities.** These will arise from the growth of a new global middle class in developing countries, the data driven fragmentation of global manufacturing chains, and a shift towards on-shoring of manufacturing, as labour costs change and the advantages of proximity to markets and production become clearer.
3. **More sustainable, with a focus on the whole life cycle of a product or service and ideas of the circular economy becoming a driver for innovation.** The growth of a resource hungry global middle class, along with the threat of climate change is thought likely to drive consumer demand towards more environmental products, the emergence of collaborative consumption models, and the re-manufacturing of end of life products.
4. **Increasingly dependent on highly skilled workers.** In the context of a (slowing) overall decline in the number of people employed in manufacturing there will be a shift in the composition, as manufacturing increasingly becomes knowledge-based work, done by multi-skilled teams. There will be a premium on 'hybrid' skills, combining deep expertise with commercial and problem solving skills.[7.]

The combined effect of these trends could lead to an increased demand for design and designers, responding to market trends and finding solutions to complex challenges. In his speech to the national academies in July 2017, Sir Mark Walport, chief executive of UK Research and Innovation said, "the new industrial revolution is powered by STEAM: Science, Technology, Engineering, Arts and Mathematics. The iPhone and the Dyson work because not only are they well engineered, but they're extraordinarily well designed. What the UK brings is not only extraordinary researchers in science, engineering, technology, arts and humanities but extraordinary designers as well."[8.]

Industrial Strategy

In the context of this changing environment, in November 2017 the UK government published the Industrial Strategy, which sets out a long-term vision for the UK economy and how it can respond

7. Foresight (2013) *The Future of Manufacturing: a new era of challenge and opportunity for the UK*. Government Office for Science: London.

8. UK Research and Innovation (2017) UK Research and Innovation Live Stream. [video online] Available at: https://youtu.be/bJ8jJaBu-tA?t=1485.

to a range of societal, technological and economic changes .[9] Capitalising on these changes becomes increasingly important in the context of Brexit, as UK industry responds to the opportunities and challenges that the transition away from the EU will bring.

Based on five foundations of productivity growth identified as ideas, people, infrastructure, business environment, and places, the Industrial Strategy also cites four 'Grand Challenges': putting the UK at the forefront of the artificial intelligence and data revolution; taking advantage of the global shift towards clean growth; leading the world in the future of mobility; and meeting the needs of an ageing society. These four domains are hungry for technological innovation and have been identified by the Government as areas in which the UK can be a global leader.

The challenge ahead for the UK is to not only respond to but also drive developments in these areas and shape future opportunities for UK businesses. The Industrial Strategy has created a clear framework for this and the five enabling pillars are important for driving this, but we believe there is a sixth: design. In the next chapter we explore why design is key and how it can help unlock these opportunities.

9. HM Government (2017) *Industrial Strategy: Building a Britain Fit for the Future*. BEIS: London. [pdf] Available at: assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/664563/industrial-strategy-white-paper-web-ready-version.pdf.

Why design matters

Why design matters

UK industry is at a defining moment as it enters this age of automation. There is exponential opportunity for designers to create new technologies, new markets and new sectors. Design is a critical tool in helping businesses to innovate and remain competitive, particularly in the face of radical and fast-paced advancements in digital technology, and applying design to industry is proven to reap benefits. At Innovate UK, this has been demonstrated in areas such as the digital economy, high-value manufacturing, stratified medicine, energy, low-impact building and the circular economy. However, when considering 'UK industry' as whole, there is a spectrum as to where different sectors sit on the 'design' scale: 68 percent of businesses admit to never or rarely using design, or using it as a 'last finish', while just 13 percent of companies state that design is a central element of their strategy.[10.]

If there is widespread acknowledgement that design is a core tool in unlocking the potential of industry and contributing to national growth and innovation, we must seek to understand where design is most effectively applied to industry and then look at the challenges that new technologies bring and shine light on how design can help.

From 'designing things' to 'design thinking'

There has been a shift in the understanding of design, away from 'designing things' to 'design thinking'. D'Ippolito sees this as an evolution from viewing design as the creation of artefacts, to design as a problem-solving activity, to design as making sense of things, to design as a key input to strategy.[11.]

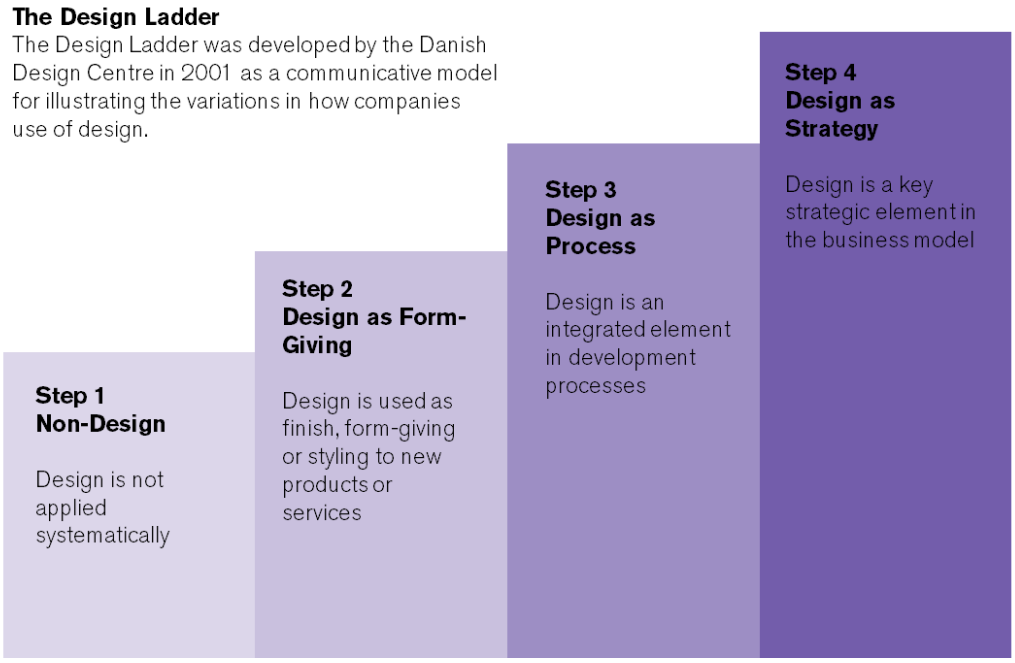
One of the ways this variation in how design is applied within firms has been described has been 'staircase' or 'ladder' models, such as the one devised by the Danish Design Centre (see figure 1 below). The ladder provides a means for individual businesses to understand their use of design and how it can develop, and has allowed for greater analyses of the impacts of design adoption at these different stages.[12.]

10. European Commission (2015) Innobarometer 2015 - The Innovation Trends at EU Enterprises. [pdf] Available at: ec.europa.eu/growth/industry/innovation/facts-figures/innobarometer_en.

11. D'Ippolito, B (2014) *The importance of design for firms' competitiveness: A review of the literature*. Technovation, 34, pp.716-730.

12. For purposes of this paper and to ignite a discussion about the range of design applications in business, we will refer to design through the ladder where it encompasses a range of applications and extents in industry.

Figure 1: The 'design ladder'



The design ladder, and similar approaches (such as the Design Management staircase) which break down the ways in which firms use design, have proved useful in helping to understand the impact of design on outcomes of interest, and to start to measure them systematically. But the precise effects of design on these outcomes – and the reasons for them – have proved harder to pin down. Design has been viewed as a secret sauce for improved national performance and for innovation, even if the specifics of the recipe are still to be properly unpicked. Key to this problem is the amorphous nature of 'design' itself, and variation in how design is deployed within particular firms. It is hard to identify the specific ways in which design may increase firm revenues, drive innovation, and strengthen national competitiveness, because design itself means different things in different contexts. This makes robust measurement difficult. As a 2012 European Commission paper puts it:

> "There is a lack of reliable and comparable statistical evidence demonstrating design's contribution to the economy and its impact on return on investment. Because of this, policy-making in design has been hindered and opportunities have been lost in better integrating design into innovation policy-making at the European, Member State and regional levels. Reliable statistical evidence would support SME uptake of design as a valuable strategic resource."[13]

13. European Design Leadership Board (2012) Design for Growth and Prosperity. Brussels: European Commission. [pdf] Available at: europeandesigninnovation.eu/wp-content/uploads/2012/09/Design_for_Growth_and_Prosperity_.pdf.

What design does

Design encompasses a wide range of activities, as we can see in the design ladder, but no matter where a business sits, it can use design to help business improve. Towards the left-hand side of the ladder the improvements are more incremental, but generally more easily implementable. As you move along the ladder from left to right, the potential for significant payback increases but also requires greater investment.

Businesses need to decide where they are on the ladder, what they want design to achieve for them, and where they want to get to. This should be based on knowledge of their market, and knowledge of their own organisation and its readiness for change. Knowing what the starting point and end goal are enables businesses to set pragmatic and realistic success indicators. It is important that success indicators are realistic in order to manage expectations and keep staff engaged in new processes. For example, if a business decides to invest a small amount in external design support it is unlikely to see radical returns on this investment, but it might expect to see some changes in the short to medium term. Equally, if a business invests significantly with a view to moving towards the far right of the ladder, it will expect significant returns, but change will not be immediate.

Deploying design thinking can help businesses understand the problems they may want to address with design. The double diamond model developed by the Design Council describes the design process and articulates how it enables the 'right' question to be set and problem to be solved. Rather than committing to a set outcome from the off, this design thinking process deploys divergent and convergent processes to identify the 'right' challenge or questions, before honing it to an appropriate solution. This focus helps move businesses away from concentrating on 'solutions looking for a problem', and rather, as Innovate UK says, on "identifying genuine economic, social and environmental viable opportunities."[14]

This applies more than ever as businesses need to find ways of focusing on future challenges. In a rapidly moving marketplace, if you respond only to current demand you may be shifted out of importance. Challenger businesses are those dynamic businesses exploiting new technologies and creating new business models that disrupt dominant businesses. Long established market leaders such as Kodak failed to see emerging trends and could not respond in an agile way to new market entrants and suffered catastrophic failures as a result. Employed as strategy, design can help to focus a business on demands to come, and not only those immediately felt.

The business case for design

We know that design also contributes significantly to the UK economy. According to the Design Council's 'Designing a Future Economy' report, design skills contribute £209bn to the UK (GVA)

14. Innovate UK (2016) Design in Innovation: Early Stage Interventions. Available at: [pdf] admin.ktn-uk.co.uk/app/uploads/2017/01/DesignBook_FINAL_web-version.pdf.

and their value is growing at a faster rate than the wider economy.[15] Innovate UK is ambitious about the potential of design to stimulate innovation and accelerate economic growth through "the wider take-up of impactful design across industry sectors and challenge areas." Innovate UK's 2015 Design in Innovation Strategy states:

> "Our aim is for UK businesses to innovate better, grow faster and achieve greater commercial success through the effective use of excellent early-stage design."[16]

According to Nesta, investments in design are among the four most important investments made by firms in intangible assets (17 percent of total investments in intangible assets in 2007), alongside investments in firm specific training (24 percent), organisational improvements (20 percent), and software (15 percent). In total, investments in intangible assets exceeded investments in tangible assets by around 30 percent, and investments in design were around 10 percent of total investments in tangible and intangible assets.[17]

It is the tantalising association between enterprise growth, innovation, and national performance that have persuaded governments around the world that design is critical to national competitiveness.[18] As Cox puts it:

> "Creativity, properly employed, carefully evaluated, skilfully managed and soundly implemented, is a key to future business success – and to national prosperity."[19]

Design in the UK economy

The UK design economy is the largest in the EU, and, relative to other countries the UK has a high use of design. In addition, the application of design by firms is high, relative to similar measures used in other countries. The European Commission's 2015 InnoBarometer survey found that 57 percent of UK firms used design in some substantive way and for 22 percent of UK businesses it was central to their strategy, the highest across all EU countries.[20]

15. Design Council (2017) *Designing a Future Economy report*. [online] Available at: www.designcouncil.org.uk/resources/report/designing-future-economy-report.

16. Innovate UK (2015) Design in innovation: Strategy 2015 – 2019. [pdf] Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/474557/Design_in_Innovation_Strategy_2015-2019_WEB.pdf.

17. Haskel, J. et al (2009) *Innovation, knowledge spending and productivity growth in the UK*. London: Nesta. [pdf] Available at: www.nesta.org.uk/sites/default/files/innovation_knowledge_spending_productivity_growth_uk_report.pdf.

18. See for example Cox, G. (2005) *Cox Review of Creativity in Business: building on the UK's strengths*. HM Treasury; NAfEH (2003) The Economic Effects of Design. Copenhagen: National Agency for Enterprise and Housing; Design Council (2013) Design for Public Good. London: Design Council. [online] Available at: www.designcouncil.org.uk/sites/default/files/asset/document/Design%20for%20Public%20Good.pdf.

19. Cox, E. (2005) op cit.

20. An annual survey of business innovation which surveys more than 14,000 firms across the EU 28, the USA and Switzerland.

Table 1: Design use by European businesses

Source: The Design Economy Report 2015 by the Design Council (p38), drawn from the European Commission's 2015 InnoBarometer of business innovation engaging more than 14,000 firms across the EU 28, the USA and Switzerland.

	Country	Design is a central element in the company's strategy	Design is an integral, but not central element of the development work in the company	Design is used as last finish, enhancing the appearance and attractiveness of the final product	The company does not work systematically with design	Design is not used in the company
1	United Kingdom	22%	20%	13%	10%	33%
2	Luxemburg	18%	26%	15%	12%	28%
3	Netherlands	18%	14%	11%	15%	40%
4	Switzerland	18%	16%	17%	15%	32%
5	Germany	17%	17%	14%	17%	33%
6	Malta	17%	39%	13%	4%	27%
7	Austria	17%	18%	22%	16%	26%
8	Denmark	15%	16%	13%	19%	32%
9	Ireland	14%	17%	15%	15%	36%
10	Romania	14%	15%	13%	16%	40%

However, it is clear that despite the higher levels of design use across the UK as compared to other European countries, there is more that could be done to ensure that UK businesses continue to thrive and get the best from design. In the context of a changing economy, there are numerous opportunities for design to grow and make a substantive difference. In the next chapter we explore why design is more crucial than ever to achieving success for UK industry.

Creating the conditions for design to flourish

Using design and deploying its methods, methodologies and mind-set has proven valuable for industry. However, UK industry is not yet harnessing the full potential of design. The UK's strong design capabilities – world leading design talent and a strong creative sector – are strengths to be capitalised on. More needs to be done to help industry unlock its creative potential if the UK is to make the most of the opportunities presented by emerging technology.

Increasing the use of design: Opportunities from the design ladder

The term 'design' encompasses an array of methods and methodologies. These range from user-centred design, to graphic design, to design engineering. It also encompasses a mind-set which is focused on identifying and solving problems, and turning ideas into practical action.

The design ladder is an attempt to describe the different ways in which these can be applied within business, from design applied at the end of a process to 'polish' the final output, through to applications where design processes are embedded in the strategic heart of the company, from where they help guide business direction and purpose.

The design ladder shows the many manifestations of design and in doing so, demonstrates that there are opportunities for a business to develop its use of design no matter where it currently sits.

At this point it is important to note two things about the design ladder. Firstly, whilst it describes stages, it is not the case that moving between them must happen in a linear, step-by-step fashion. It is possible for a business to 'leapfrog' and move up several rungs at a time. Secondly, it should not be assumed that all businesses should be striving to move quickly to the highest rung of the ladder, regardless of needs or ambitions. Rather, the model provides a light touch framework to enable businesses to consider their own use of design within the context of its potential different applications. Doing this allows potential opportunities for development to be identified.

Ultimately the choice of how and when to act will vary from business to business. It may be that a company decides, on reflection, that they are in the right place for now. Or perhaps a small

step, in say trialling design processes to gain user insights, is all that is currently requited or feasible. Another firm, by contrast, may feel that their business and market demands them to strive for more strategic uses of design. For them incremental change may not be what is required.

This point about incremental change versus transformative change is a subtle yet important one, and both approaches need to be supported. It is important to be pragmatic and recognise, on the one hand, that not all businesses can or need to strive to be on the highest rungs of the ladder, and to appreciate, on the other, that gains from efficiency are sometimes not sufficient. In practice, this means that opportunities need to be provided for all businesses, wherever they sit, to be able to move up. Even if incremental change takes place, collectively across many firms this could yield significant results from industry. However, it is also important that firms with the desire and capabilities to be moving into the highest rungs of the ladder are supported to do this. This stage of the ladder, where design is embedded within the company, is where its impacts can be transformative. This transformative or visionary nature is particularly important for addressing new or emerging challenges. Hugo Spowers, Founder of Riversimple, a UK-based hydrogen fuel cell car company, has noted that incremental change and optimising the component parts often seems like the 'right' thing to do when you are working within a complex and mature system, but does not usually lead to transformative step-change.

Transformative change offers the opportunity for a company to define and lead a sector (consider Uber or Apple's ability to set market direction). This quality is needed for addressing the Industrial Strategy's Grand Challenges. These areas are emerging and have been identified as sources of opportunity for growth within industry. They will be capitalised on by companies which possess a vision for the future and the capacity to make it a reality. Sam Turner from the High Value Manufacturing Catapult, sees, for example, that big wins will be available to those who can successfully combine data-driven approaches with human-centred approaches. The mind-sets and processes within design offer this potential.

Overcoming the barriers to deploying design

There are barriers to the uptake of design by industry. Interviews for this paper described the challenge that businesses can have in understanding exactly what it is that design will offer them, the difficulty in accessing the skills needed, and a perceived risk in investing in design.

These echo the findings of the 2005 Cox Review of creativity in business.[21] It identified five key obstacles preventing SME's from making greater use of the UK's creative talents: lack of awareness and experience; lack of belief in the value of, or confidence in, the

21. Cox, E. (2005) op cit.

outcome; not knowing where to turn for specialised help; limited ambition or appetite for risk; too many other pressures on the business.

More than a decade later these same challenges still resonate with the industry as being barriers to the greater take up of design. They are significant challenges and, as the Cox Review points out, are much to do with attitude, understanding and behaviour – all of which are complex to change. However, much has happened in the intervening decade and the benefits of design are arguably more widely sought and recognised. With the launch of the Industrial Strategy, now is an important time to take action on accelerating the use of design by industry.

Insights from industry have helped to identify conditions required for achieving this, and overcoming the barriers faced. These fall broadly into conditions required in three domains: people, culture and networks.

People: individuals and teams with diverse skill sets can help design to flourish

Deploying the methods and methodologies of design requires that broad skill-sets be held by both individuals and teams. Skills drawn on are those which can be described as 'hard' or 'technical' skills, and those referred to as 'softer' capabilities. For example, technical engineering knowledge is required to create viable products. But equally important to that outcome are skills, such as empathy, which help to understand the consumer needs, or those which enable sections of a business to work together, like good communication or problem-solving skills.

The UK needs to be cultivating this broad range of skills in order to deal with the demands of tomorrow's workplace. This goes beyond design-specific education into general education, and into the workplace. An artificial division between creative and non-creative sectors and skills still exists in much of the formal education system and is seen as a challenge to cultivating the skills needed for design to flourish across industry.

As well as having these skillsets available businesses need to understand where and how to deploy them to achieve their desired outcomes. The design ladder highlights some of the considerations here. At the lower stages of the ladder, where design is starting to be used, it is possible to access its skills and processes from outside of the business. For example, a company will commission the creation of an advertising campaign, or might buy in a discrete piece of consumer insight. However, the application and use of design at the higher rungs of the ladder requires that design skills are more fully integrated into the organisation. Design is successfully deployed at the strategic level when the skills which power it are within the business. As businesses move up the ladder then, they need to invest more in growing design capacity internally.

As well as encouraging design skills it is important to encourage a broader diversity of experience and perspective within industry. Diversity is valued by design-led thinkers and organisations.

Different opinions and ways of thinking are valuable for helping envisage new scenarios, or to identify and solve problems. Caroline Simcock explained that diversity is important to design because having multiple viewpoints can help identify the real challenge at the heart of an issue, and ensure that alternative avenues are not missed. She added that the lack of women in industry is a significant missed opportunity for the sector. Gender is one of a range of aspects including age and ethnicity, which are important markers for diversity. Encouraging diversity should continue to be a priority within industry.

Culture: design flourishes in, and helps create, cultures with collaborative ways of working

As much as diversity is important, so too is creating a culture of collaboration where these different skills and experiences can meet and work effectively together. In diverse teams design processes can act as the glue which brings disparate ideas together and helps to translate them into actions and solutions. Neal Stone, founder and director of leapSTONE, explained that "at the heart of design thinking is the notion that good ideas can come from anywhere, and could be anything. When that attitude truly permeates an organisation's culture, design is able to create real and meaningful impact."

This collaboration extends to the relationship between industry and the design or creative sectors. In stepping up to the challenge of the Industrial Strategy there is still uncertainty about the exact mechanisms by which design creates its impact. As long as this remains, some will continue to see the use of design as alchemy. This, understandably, creates a barrier to articulating its value. To help overcome this it is important that designers speak plainly about the processes and impact of their work. For some in industry the perceived 'language of design' can be confusing, but businesses should neither be put off by language nor feel afraid to challenge what they don't understand. Designers should make sure language is fit for business purposes.

It is important to recognise that when a business at the higher stages of the ladder uses design, it is embedded within the culture and practices of that organisation. Industrial designer Laurence Kemball-Cook, now CEO of UK energy company Pavegen, proudly refers to his organisation as a design led business.[22] The off-grid energy start up has grown rapidly since it was founded in 2009 and Kemball-Cook has deployed design to drive innovation and help his business scale and reach new markets. Pavegen provides a case study of how a design led business can win investment in agile ways – having completed its first successful investment round in May 2015 using the crowdfunding platform Crowdcube, accumulating over 1,500 investors and reaching the £2m mark in under two weeks. With a strong network of investors in place Pavegen now boasts an Advisory Board, led by former Apple executive Jeff Martin and

22. Kemball-Cook, L. (2018) RSA Events, Design, Industry, Opportunity. [video online] Available at: www.thersa.org/events/2018/03/design-industry-opportunity.

former Interface FLOR president Greg Colando – making the UK company a global player in design.

Moving boldly into this space involves confidence and an appetite for change. Embedding design requires shifting structures, processes, and sometimes even physical spaces to enable different working practices. As an organisation moves further up the design ladder applying design should become less and less about a discreet project or team, and more about a shift in culture across the business. IBM, for example, use three pillars: people, places and processes, to describe the way in which design is manifested within the organisation. To take the 'places' aspect of this, a number of other organisations also described the importance of having physical places where teams interact, as well as the importance of responsibility for design residing in the senior management of an organisation. In this way the impact from design can be maximised.

The importance of design being embedded in culture extends beyond individual businesses. If its opportunities are to be truly harnessed in UK industry then the wider industrial sector, its institutions and networks should also look to embrace design and design processes.

Networks: strong and accessible networks can inspire and inform

Having networks through which businesses can share and be inspired by design's capabilities is an important condition to be cultivated. Industrial businesses draw inspiration and information from the actions of their peers. These relationships and networks can drive businesses to consider their use of design. Understanding how an organisation similar to theirs has introduced design is likely to be more fruitful for a firm than looking to companies held up as global design leaders, such as Apple or Dyson, and more likely to encourage them to try ideas themselves. This is especially true for SMEs, which make up a large proportion of UK industry and are very diverse in size and governance and location; local networks are very important in this respect.

While there is particular value in drawing inspiration from similar businesses, there is also value for industry in learning from different sectors - just as diversity of perspective is important in the design process. For design to flourish in industry, networks and relationships between sectors should also be encouraged and facilitated.

Recommendations

The following practical recommendations seek to generate a stronger use of design by industry. Importantly, the recommendations demonstrate that it is not only industry which needs to take action in order for this to happen. Rather, multiple stakeholders play a role in achieving this ambition and commitments are required from policy makers, educators and design practitioners, as well as from industrial businesses themselves.

It is hoped that the following recommendations will stimulate debate amongst industry and wider stakeholders.

1. **Embed design support into existing industry institutions and networks, to help businesses access wherever they sit on the 'design ladder'**

A business's requirements for design support will turn on several variables: where on the design ladder they currently sit; how they aspire to use design; and how ready their organisation is for implementing changes and 'moving up the ladder'.

For example, a business which uses relatively little design may need help to identify what skills they need to access and where to find them. This might be working with an external agency on gaining user insight for a new product range. On the other hand, a business with a more established use of design may need to access support to help embed design processes across their organisation, and build in-house design skills. These requirements are different, as are the implications for investment from the organisation. Businesses should to be able to access support for these different kinds of needs. This may include helping them to diagnose their current situation and the right course of action.

Institutions and structures that exist to support industry should ensure that design is part of their offering in order to meet this wide range of business needs. One example of this is Innovate UK's network partner, the Knowledge Transfer Network (KTN), which provides innovation networking for other funders in line with its mission to drive UK growth.

Another example of this is the Catapult network and the associated Catapult Centres, also established by Innovate UK. These are a series of physical centres where the UK's businesses, scientists and engineers work together to transform high-potential ideas into new products and services. As core hubs of expertise, with strong networks of organisations, these centres could act as stronger proponents of design within their sectors.

The Catapult Centres have a great track record in helping

organisations of all sizes to innovate and some have already established a design capability. That said, much more could be done to encourage the use of excellent design by UK companies, and to help equip them to use excellent design more effectively. Indeed, given the importance of SME's to the economy, and the fact that they tend to have fewer resources, it is essential that SME businesses are able to access the support offered by the Catapult network and other similar networks.

2. Ensure that design support is accessible at a local level

The Industrial Strategy identifies 'place' as being key to unlocking full productivity potential in the UK. This geographical dimension is also important for increasing the use of design. Local connections and networks are important sources of support and inspiration for industry, and businesses should be able to be inspired about design's value by others in their networks and be able to access design support locally.

The Design Economy Report points out that the top six local authorities with the most significant concentrations of design activity in Great Britain are in London,[23] encouragingly there are also clusters of high quality design across the country including, for example, Dundee which is a UNESCO City of Design and home to the new V&A design museum. [24] These clusters need to be identified and nurtured in order for them to inspire and support their local industry.

The Industrial Strategy advocates for the development of the local industrial strategies. These strategies should outline how the use of design can be supported locally. As part of this, a design capabilities audit should be undertaken to assess current skillset, needs and potential. To ensure this support is appropriate and effective, Government should encourage local bodies to consider how to encourage the better use of design as part of their forward strategies.

3. Share relevant research and insights between sectors

As well as learning from each other, and from sector specific networks, businesses can also look to other sectors for inspiration and insights about deploying design processes. They should actively investigate opportunities to do this, for example by learning from firms who encourage diverse skill sets amongst their staff to enhance organisational creativity. Businesses could draw in new skills through collaborations with other sectors, or through partnerships with local universities.

An exciting opportunity for cross-sector learning is presented by the merging of the Research Councils and Innovate UK, together with newly formed Research England, into one new organisation – UK Research and Innovation (UKRI).

23. Design Council (2015) op cit.
24. Dundee City of Design (2015) [website] Available at: www.dundeecityofdesign.com.

This formation offers the enhanced opportunity to bring together different sectors through funding streams and networks. UKRI has the opportunity to use co-design frameworks which will ensure that cross sector collaborations are effective and fruitful bringing together different research communities. Here design can act as the glue and the translator, helping ideas move into practical application.

UKRI could also investigate opportunities for leveraging 'design relevant' skills found in other sectors and connect them with industry. For example, many social science disciplines have skills useful for understanding human behaviour and needs which can be useful in the design process.

4. Apply design thinking to solving the Grand Challenges

Design thinking should be central to the implementation of the Industrial Strategy, at both local and national levels. For the direction of the Grand Challenges it is particularly important. These are broad and complex areas, with emerging technologies adding to the intricacy. Within this domain design is critical for drawing out the real problems in need of addressing. Doing this well will elicit high quality innovations developed in response to genuine environmental, social and economic opportunities. It will prevent the development of 'solutions looking for a problem' which fail to truly address needs. This application of design thinking should take place at all levels as the Grand Challenges are explored, from government policy development, through the setting of challenges and funds from organisations like UKRI, through to individual businesses product development and strategies.

One avenue for this is to ensure that where appropriate, the Industrial Strategy Challenge funds offer design support and encourage entrants to evidence strong use of design thinking in their applications and investigations.

5. Ensure that design is discussed in an open and accessible way

Despite the available research demonstrating the value of design to industry, there is still uncertainty about the mechanisms for how design exerts this power. As long as this remains the case, some will continue to see the use of design as alchemy, and this, understandably, presents a barrier to convincing those within businesses to invest in it. Businesses need help understanding the specific benefits for them. The language used to discuss design can be unclear, and as design's broad portfolio of activities and processes can render it challenging to understand.

To help do this design practitioners should make sure the language they use is fit for purpose and clearly explains their value proposition to industry. Approaches which break down the use of design, such as the design ladder, and show its different aspects are likely to be more effective than those which present design as an amorphous whole.

6. Reduce perceived risk in investing in design

Investing in design requires conviction and confidence that investments will pay back. There are numerous ways in which businesses can be supported to take this step by making it easier for them to access design.

New business models in which designers and design firms work differently with industry are one route to explore. For example, there could be opportunities for designers to invest financially in partnerships or use royalty models. Models like this could help the design sector and industry work more in partnership and share risk.

Support from government is, of course, important for enabling exploratory partnerships and activities. One area worthy of further investigation is the impact of R&D tax credits on the take up of design, to ensure that a spectrum of design activities are incentivised through this scheme.

It is worth noting that matched grant funding for design is a key mechanism by which perceived risk in design can be reduced and a way to encourage firms to 'have a go' at deploying design across their business. Through Innovate UK's 'Design Foundations' competition and the inclusion of design activity in the scope of a range of other grant competitions, new types of innovation are emerging and it would be wise to capitalise on this momentum.

The investment community also has a key role to play in incentivising businesses towards using design. Investors should demand to see strong design capabilities from businesses and support them to develop their capacity in this area.

7. Invest in broad design education that brings together design and business

The Industrial Strategy clearly recognises the need to for the UK to invest in creating a skilled workforce. Design capabilities should be considered part of this and warrant serious investment. Alongside the technical skills which the UK needs to develop, 'softer' skills like empathy and problem solving need also to be cultivated. These design skills are necessary for bridging disciplines, understanding and shaping customer needs, and moving from ideas into successful commercial activity. The UK government should commit to greater investment in design education as part of the delivery of the Industrial Strategy.

School and university education are, of course, important. That said, training also needs to be available to those already in the workplace. The government recognises this in the Industrial Strategy through its plans for a National Retraining Scheme. As technology develops and jobs are impacted, the UK will increasingly need its workforce to be able to work across disciplines and synthesise large amounts of information. Design skills help to do this and should be taught as part of this scheme.

Design students also need to have stronger business knowledge in order for them to be able to work more effectively with industry. Understanding business and business needs should have greater

weight within design education and educational institutions should develop greater business skills and commercial acumen in emerging designers. To this end, it is increasingly important that education not only seeks to encourage a broader range of skills in designers but that those designers themselves are a diverse and broad range of people. As has been stated in design education manifestos time and again, diversity is an imperative for business and particularly design in the future.

Conclusion

Society and technology are changing at rapid pace and these changes present countless opportunities as well as challenges to UK industry. These trends have, and will continue to bring about, significant change, and UK businesses must be ready and equipped to make the most of the potential these changes carry. It is how UK industry responds to these changes will shape its future trajectory and success.

The UK is well-placed to drive growth and innovation in a range of domains, particularly those outlined in the government's Industrial Strategy. But there is work to be done to stay ahead and capitalise on these changes. Design has a critical role to play in helping UK businesses to do this successfully. To this end, industry is challenged to keep pace with a changing global market and to understand how design can be a means to successfully engage with customers and employees in a way that ensures agility, flexibility and innovation. Much evidence exists already confirming the importance of design for industry and innovation, but the depth and breadth of design use across sectors could be stronger. This can only be done through a multi-stakeholder approach that understands how to develop and nurture culture, people and networks for maximum benefit.

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