

Name: **Susan Down**

Student Number: 2100786

Course: Surface Pattern Design (Textile for Fashion)

Tutors Name: Julia Lockheart

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QUESTION 5: From the series of Thinking and Making research strand lectures, choose a theme, movement or selection of artists or designers that relate to your practice or interests and construct a 2500-word essay. Critically assess primary themes, key writers, and relevant practitioners.

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It can be argued that the most definitive ways to solve problems is through science, with reliable research to provide answers to help navigate questions, the sciences provide solutions to problems. Whereas the humanities focus on analysing and expanding our understanding of human experiences and culture. In design we explore the processes in production of objects in the man-made world and those that surround us. 'Historically, design has been fairly unscientific, design is much closer to fine art than science,' (Muller, 2020) where designers and artists primarily strive to create products that are functional, attractive and expressive. While the focus of design has always been and remains on aesthetics, science and engineering have been crucial throughout design history with discoveries in science and technological advancements leading to production of new materials and mass manufacturing. Technological innovations such as these have been made accessible to a larger population, an example of this can be found in the Pop Art movement in the 1950's through Andy Warhol's photographic silkscreen prints 'the symbiotic interplay between technological culture profoundly shaping and altering our perceptions' (Sunmair, 2022) arguing that engineering and science enabled progression in design and the arts. In *Designerly Ways of Knowing* Nigel Cross, explored the relationship between science and design explaining how science was integrated into design to meet demand for innovation and production in the arts, 'the world for doing and making is usually ahead of the world of understanding' (2007, p.26) suggesting that design can contribute more to science than science can to design.

Design and science are two vastly distinct fields of knowledge each with their own expertise, science examines existing data analytically to generate new understanding whereas design uses an understanding of existing knowledge to translate abstract requirements of human wants into concrete products for the future reality. To keep the progression of innovation and forward thinking flowing the two must be integrated. According to Nigel Cross (2007) this parallel between science and design became prominent in the 1920s and 1960s, two pivotal decades in the modern history of design. This notion of Scientific Design where designers applied an evolved method of problem solving that is solution focused, emerged in conjunction with Cross's research in the late 1970's, 'Explicit knowledge about objects and about how they function has sometimes led to significant improvements in the design of the object' (2007, p.26) this understanding of thinking has revolutionised how practices in relation to design can apply intuitive methods of approaches to problem solving solutions. In Cross's book, *Designerly Ways of Knowing*, he describes the three systems of thinking that make up the 'knowing', 'Better to regard the third culture as technology, rather than design.' (2007, p.18) his research into epistemology and the notion on relationship between

creative processes and technology is the general theme argued throughout his book. Considering the research presented in Cross's book (2007), it can be argued that both education within design and design research have progressed into a separate distinct discipline. The Design Science Journal written by Gabriela Goldschmidt and Maya Weil gives an insight into the stages of design reasoning (deductive, inductive and abductive) debating whether the use of the scientific method has impacted design research and education as well as explores the future in Design Science. Design reasoning at the early phase in which 'designers are engaged in a search with many ideas and possibilities are typically raised and examined' (1998, p.85) this is accomplished by reasoning based on observations of scientific evidence 'in an attempt to construct coherent rationale for a design idea' (1998, p.85). With advances in technology and manufacturing such as the developments in software and integration of social media, the processes required to design both the physical product and user experience resulting from that designed outcome have been challenged – a greater complexity in the design of development and processes, where the later stages of design reasoning specifically the adductive stage, are required. Goldschmidt and Weil 'classify these design problems as ill-defined' (1998, p.85) recognising that design science in the future requires looking at theories and applying methods from other studies along with an understanding of existing knowledge of products, meaning that manifesting new generations of products that may be in line with predicted future trends cannot be derived solely based on creativity.

'In Design Science, product and system design is addressed by combining analysis and synthesis, and drawing from many scientific disciplines' (Papalambros, 2015) it can be defined as knowledge derived through observations and analysis, where reasoning is systematically structured from which the general principles of design can be derived from, simply put it can be described as 'interrelationships between system components' (Buckminster Fuller Institute, 2022). An example of a Design Scientist who followed these principles was American Architect Buckminster Fuller, he labelled himself as a 'Comprehensive Anticipatory Design Scientist' (Keats. 2016. p.186) as a designer his creative ideologies focused on the individual elements or aspects of a new design refocusing on the individual areas rather than the overall design as to not leave anything critical out. As futurist Fuller attributed conceptual tools for thinking and reasoning, that can even be applied in today's design world. Through his works such as The Geodesic Dome he has taught that as a Design Scientist it is important to work 'collaboratively towards solutions to pressing problems for the betterment of humanity' (Buckminster Fuller Institute, 2022) in this context Fuller clearly states the importance of synthesis withing procedures in design, emphasising on the effectiveness and efficiency. Furthermore, Fuller's anticipatory thinking enabled him to create revolutionary designs as his values as a Design Scientist allowed his processes to progress and developed in his desired direction. A quote from a science journal Design Science: Why, What and How, stated that 'Research was the way to gain design knowledge, namely, in different laboratory and field settings, whether experiments or case

studies. A multitude of methodological approaches were used' (Papalambros, 2015) signifying that a clear systematic and methodical discipline of design is required rather than it being fragmented within subsections of science and arts, further agreeing with Fuller's ideology of cohesion and collectiveness. Incorporating Science into design can be accomplished in other aspects such as through the objective of sustainability, where the designer's concern for the environment means reducing a products overall impact short and long term on the environment, this may be through the implementation of improved sourcing of new materials and energy in the hopes to carry out effective sustainability in design.

Dieter Rams was one of the first designers to incorporate sustainable practises into his work believing that 'design can and must maintain its contribution towards protecting and sustaining the environment' (Design Museum, 2017) where being sustainable was one of his key principles. As a key designer, Ram's philosophies and influence has been widespread, even reaching brands such as Apple, where the sleek and minimalist designs of their products reflect to his own work. Rams' design principles, also known as his ten commandments, demonstrate what constitutes to a good design that incorporates both function, practicality, sustainability, usability, and aesthetics. 'Good Design is as little design as possible. Less, but better – because it concentrates on the essential aspects, and the products are not burdened with non-essentials. Back to purity, back to simplicity' (Rams, 2019) implying that an innovative design is a well-designed product that is easily understood, however we can infer from Ram's statement that designing a successful product goes beyond creativity; technological advancements play a significant role in innovation, providing new opportunities to help designers improve their work, 'innovative design always develops in tandem with innovative technology, and can never be an end in itself.' (Rams, 2019)

As we transition to using Artificial Intelligence for production in industries, there are concerns that designers will be replaced with machines as they are more efficient and cost effective compared to humans, an article from Forbes summaries that 'AI and machine learning are also automating jobs involving judgment and decision-making. This opens the door for machines to compete with and outperform humans in cognitive tasks.' (Sawhney, 2018) AI focuses on developing technology that can make informed decisions autonomously, this poses significant challenges towards the human workforce due to the system's evolving capacity for learning and improving, raising the possibility that it may replace tasks done by human designers. Within *Designerly Ways of Knowing* (2006) Cross not only explores the ideology behind Design Science but also delves into the comparison between technological tools used within art in place of the expertise of skilled designers affirming that 'Design is something that all people do; something that distinguishes us from other animals and so far machines' (2006, p.49) implying that technology will overtake human ability and surpass human skill. This quote highlights the importance and value of

craft in design, noting that handmade products benefit consumers in more ways than mass-produced goods; purchasing handcrafted products not only ensures the quality is higher, but also allows consumers to appreciate the artist's creativity and the authenticity of the piece.

The Arts and Crafts Movement exemplifies this emphasis on craft and skill, 'The Industrial Revolution evoked varied emotions from society' (Singh, 2022) both enthusiasm for scientific progress, technological advancements and the decline of artistic integrity were brought about by the hardships of labour, primarily of the working class. The Arts and Crafts movement in the late 19th century was one of several movements that emerged to oppose the Machine Age and is regarded as the influence that established the foundations of modern design. This movement emphasised how artists and consumers should rely on practised skill and craftsmanship rather than machinery, utilising the handcrafted processes, as a stance against machine manufactured goods. An article written by Simran Singh (2022) emphasised on society's overreliance on technology 'Advocates of the Arts and Crafts Movement perceived the soulless machine-made production caused humans to become slaves to the industrial machine.' (2022) referring to the fact that mass manufacturing had a significant impact on society, resulting in a lack of worker rights and job losses for many in the working class. Replacing the workforce with machines meant manufacturers could produce goods at a faster rate, this efficiency and low-cost method of production increased the popularity of machine use over human labour ensuing to the rise of social unrest and significantly impacting the economy. By using the word 'slave' Singh suggests that society has become so reliant on technology, that it has become a necessity for us to function, even overvaluing its worth implying that humans are trapped and controlled by machines thus we are 'slaves.' With the focus less on craftsmanship typically, manufactured goods of that period lacked creativity and quality in design. Followers of the Arts and Crafts Movement resisted this notion, with artists such as William Morris insisting that handicraft and artistic creations reflect the true intentions of the artist and will always be superior to those produced by machines.

Science and engineering has been a key contributing element to the advancement of design with leading innovative technology such as the emergence of AI computing 'One could argue that design makes scientific progress visible and usable' (Muller, 2020). However, other factors, such as designers' cognitive processes and new approaches to problem-solving, have helped boost creativity in design as the interaction between design and science has become more progressive. These adapted ways of thinking along with key designer influences such as Dieter Rams, with his design principles ranging from sustainability to the less is more approach and Buckminster Fuller, whose ideology on 'Comprehensive Anticipatory Design Science' (Keats. 2016. p.186) attributed conceptual tools for thinking and reasoning. According to research compiled within Dieter Ram's book *Designerly Ways of Knowing* (2019), designers have revolutionised how other practises have

integrated the use of processes and information from other fields of expertise, this concept of progression and collaboration has kept innovation flowing. On the one hand, it can be argued the future of design is AI computer and technology led, with Machines outperforming and replacing the human workforce, whereas movements such as the Arts and Crafts Movement were historic in highlighting the importance on skill and handcrafted art, demonstrating that machine and mass-produced goods may not always be better. 'The ideologies of the Arts and Crafts Movement conflicted with Futurism which glorified industrial society with the use of religious and naturalistic motifs.' (Singh, 2022) Ultimately the Arts and Craft movement fought against capitalism and the division of labour while refocusing on traditional crafting methods. I strongly believe that as artist and creators, we must engage with scientific disciplines and 'bring the qualities that are inherent in design to the sciences' (Muller, 2020) in order to meet the demand for innovation and cement the need of human designers within the creative world. The ability to design is natural for humans, where inspiration comes organically, and craftsmanship is highly valued, as consumers we are drawn to items that are one-of-a-kind, that demonstrate authenticity while also emphasising quality in terms of materials and craftsmanship. While artificial intelligence may be capable of replicating processes to reproduce the same works, it lacks sentience therefore reducing its value.

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