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DRIVER FOR SUSTAINABLE (INDUSTRIAL) DESIGN CULTURE – THE >DESIGN SHIFT<

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ABSTRACT
The high quality of design products is a consequence of sustainable design, investigation of origins as well as requirements and additive design qualities while focusing on responsible cultural and material conduct. To think, to produce, to invest in a sustainable manner, means to act responsibly in production and economic circles to arrive to circular concept models. In addition, cultural education is the greatest investment in sustainable economies. All these facts are based on the industrial heritage and of course on the waste produced during individual lives as well as impassioned people. With the digital revolution of the 21st century, on the one hand a "design shift" (Wachs, M.-E.) comes into consideration, comparable to the cultural turns (Bachmann-Medick, D.) of the 20th century. On the other hand, a look at the changing working conditions in industrial design engineering circles - with consequences for the production process, the design process and of course for education, has to be examined and evaluated. The thesis will discuss the importance and impact of inter-scenario design, the related creative process and the impact of individual design power. (181 words)

Keywords: Change in cultural behaviour, design driver for sustainability, sustainable thinking in design studies, design shift and cultural turn, sustainable education in design/engineering

1 INTRODUCTION

The term “industrial design” as defined with the help of ten laws for good design, by the great German industrial designer Dieter Rams, describes on the one hand the functional needs from the consumer’s perspective; the human being and how it deals WITH products – in relation to product design, as described by the anthropologist Michael B. Schiffer: “The concept of life history is known in a variety of fields including engineering […] in which product design models are broken down into the major steps, such as procurement, manufacture, and use, to identify performance requirements for a technology’s various activities.”[1] [1] On the other hand the industrial design process is related to conventional design methods of sketching and the phenomena of so called *design driven by technology* or *design driven by material*. Form and material in relation to product services are in line with production possibilities: the Braun razor from 1950s, designed by Dieter Rams, is the result of a linear economy; sketching a razor created the parameters for production after having the industrial tools made of metal as well as the moulding dies, and after this was completed the marketing strategy and the retail possibilities were considered.

Industrialisation created the basis for design handling, and a linear, sequential planning process. After the sustainability revolution at the end of the 1990s, when the awareness grew that there was a lack of materials and that natural sources such as mineral oil were finite, the pressure on the circular economy that is pronounced today began to be obvious. This sustainability in all three pillars, not only with a focus on materials, is not an invention of the 21st century, but with regard to the economy, and the interest of brand managers – as well as stakeholders of course – it seems to be hard to integrate into all business levels.

Regarding the early design drivers for the industrial design culture of the linear economic model after World War II as the long-term state of the art, the design driver’s influence for industrial sustainable design within the circular economy today will change. As the digital revolution is now pushing new paradigms for new process parameters and interlinked teams of production, designer are looking about

[1] Skibo, J.M. and Schiffer M.B., 2009, p. 9.

new fields of industry and in consequence about a new field of industrial design and naturally modified design methods.
What about the design driver for the next step in digital design generations, when changing production conditions will be accompanied by new design drivers without following any hierarchical structure. At least the consequences will be discussed within the framework of a “design shift” with regard to the design/production process and of course for design education.
The following parameters are important to consider in this thesis:

- Changes in technological processes in relation to life patterns as a question of identification (and of talent).
- Material and cultural behaviour concerning things as a "driver" of developments in design and technological innovations.
- Comparable design studies within the scope of historical, sociological and anthropological evaluation.
- The correlation between design + engineering and the pedagogical / educational impact
- Sustainable education and working conditions as a factor influencing change for (and loss of) manual skills and the need for analogous AND digital education-based areas.

2 CHANGE IN PRODUCTION PROCESSES DURING INDUSTRIALISATION – CHANGES IN MATERIAL AND CULTURAL BEHAVIOUR

With the help of western cultural design heritage as part of European comparison studies, the significance of three-dimensional collections are discussed in relation to industrial production processes. It is not only the high narrative value of the design heritage within the cultural mind (Assmann, J.) and the material mind (Wachs, M.-E., 2008) for the individual, which is represented by objects. It is a collective heritage which restores social value and shows the state of the art of technical developments in the past to take benefit from these: It not only inspires to think about the conditions of the past, its rituals and representatives, it gives the chance to reflect upon tomorrow's needs in design processes.
Valuable artefacts provide evidence of the identity of people and things and regions, evidence of typical lives in relation to industrial working conditions and individual skills. They are the testimony of our social and economic history showing the cultural and material behaviour in relevance to cultural studies and naturally to design studies.
When thinking about textile heritage, it does not only include woven fabrics made at home in rural areas until the establishment of industrialised manufacturing cities that occurred with the invention of innovative machines such as the Spinning Jenny (James Hargreaves) in 1764, and the first steam engine by James Watt as the driver for a new step in the evolution of civilisation. New imprinting cultural aspects had a greater impact on so many individual lives, for women in particular - a result of rapidly expanding cities. The driver in industry in countries such as the United Kingdom was not only the result of the inventions and the innovators, but of a million workers in and around the city of Manchester in 1800 (Bremm). [2] Other textile industrial cities and centres with high technological expertise evolved in the following period in Europe such as in Lyon, St. Gallen and the region of the Lower Rhine in Germany. This was the time when high-tech objects were industrially produced, and the effect of innovation gave rise to a new value of objects. People of the older generation appreciated the value of the old handcrafted things more highly as durable, long- lasting goods, as proof of a common heritage of the family. Other people living in the city who participated in the new richness of possibilities and industrial = cultural goods, considered the new industrial goods to be an improvement with regard to the quality of products and of course of life. Material-based products, driven by the passion of innovators of industrialisation, driven by new technology and the first acclaimed designers were held in high esteem by European markets.
This history continued through to the late 1980s, when new designs developed more as *service* solutions, evolved as consequences of the experiences of artificial intelligence than as *product* centred solutions. These design concepts were generated to automated production processes and upcoming information technology (IT), last but not least in relation to the Internet as a working tool. When the sociologist Christiane Funken described a link between the product based economy and an *economy of knowing (“Wissensökonomie")* [3], due to the fact that most first-world companies such as Henkel, Vorwerk and others are no longer producing material-based products such as cleaner, electrical goods and carpets but are now producing *concepts*, idea-based solution *strategies*, production *services* today.

The change in cultural behaviour with regard to objects expresses different cultural turns, a topic that was discussed with regard to various related disciplines within the context of Anglo-American cultural studies and the German “Kulturwissenschaften” (cultural sciences) at the end of the 20th century. [4]

3 CHANGE OF WORKING CONDITIONS RESULT IN CHANGES IN LIFE AND IDENTIFICATION WITH REGIONS, COMPANIES AND THE WORK OF INDIVIDUALS AND SOCIETY

Changes in technological processes always have consequences and result in changes in life patterns as a question of identification and of identification with a brand, with a discipline or regions, which was adapted to local production and local headquarters as a memorable place. Identification with the product and the brand was frequently created by the family's working conditions (case study of silk production in Krefeld, Germany, e.g. Verseidag GmbH; Mönchengladbach, Germany, Tuchwerke Willy Schmitz GmbH & Co.Kg.). The success of the brand's product is linked with the technological know-how and development of the humans involved, the workers, the designers and inventors. We recall how corporate espionage occurred from the beginning of 14th century, when skilled silk workers left Lucca (Italy) [5], and were regarded as a veritable goldmine by their European competitors. There is also the question as to whether the textile espionage between Great Britain and Germany after WWII during the 1950s and 1960s was so widespread [6] although or because the seal of quality “Made in Germany” had already been invented by the British Government at the end of the 19th century.

However, on the other hand, technology and the demand for products is mainly dependent on the principle of progress and secondly on the principle of the unity of knowledge, at the latest since the scientific revolution during the 16th and 17th centuries and the industrial revolution since the 18th and 19th centuries. [7] The belief in technology wins through during the 20th century and at the beginning of the 21st century, when the craftsman’s work as *human capital* competes with the power of market tools as a commercial utility. [5] The epochal break of the postmodern perspective to argue a new techno science (Channell, D.F. et al.) with a new, post-academic scientific mindset is linked with the markets and human capital tools. The commercial demand for new ways of producing and retailing in a digitally dominated world is related to the demands of humans, fascinated by digital possibilities. Does that mean that the belief in progress and in technology is being substituted by *possibilities* or by scenario thinking models? Working spaces are today homeless, dematerialised, home working for enterprises around the world is state of the art, which are producing goods in locations of which are completely unaware, without any localised identity with a brand's flagship and without headquarters. On the contrary, the fashion and textile companies are proclaiming great product value with high quality based on long-term experience and tradition-based competence by using heritage as a factor [8]. What will the non-material textile heritage of the future be, what is the purpose of this new world of techno sciences? The parameters of the economy are *time and space*, also evidenced by another look at innovation in the textile industry in the year 1733, when John Kay from Bury in the north of England crafted the flying shuttle which was regarded as THE key innovation (Liedtke, R.) [9] of the industrial revolution. The fact is that this machine, this innovation, speeded up the output of the mechanical weaving looms, questioning the parameters of society's values in manufacturing and producing wealth. It expresses the long-term, high-tech based culture, formed by the identification of the human being, the human capital is very extensive.

The identification of employees depends on the responsibility of the enterprises and their entrepreneurs, *but* also at the beginning of the 21st century on the “entrepreneurial universities” [7] with regard to post academic science. Science is no longer a specific factor of the inner workings of the university, as the university context has changed and is fluid today – the factors time and space having already been mentioned. The global transformation in the way science is organised, managed and performed [7] and how the creation of know-how is managed and organised today, is different than it used to be. A change in working and societal identification, in design and engineering education, are accompanied by a new management transfer and possibilities in best practice models.

4 THE CORRELATION BETWEEN DESIGN + ENGINEERING AND THE PEDAGOGICAL / EDUCATIONAL IMPACT

The correlation between design + engineering is based on manual sketching in reference on the one hand to the term *design* and to the *analogue act of* doing, since Leonardo Da Vinci's sketches of flying machines, for example, during the Renaissance period, as a method of communicating one's ideas about machines and the production conditions of the future. On the other hand, design and engineering developed with the aid of *technical sketches* to create the tools, the production possibilities to depict design as an object: an item of furniture, a lamp, a cooking machine, a textile cover. Beside this, engineers used a different understanding of the term design; taking the sketch to create the tool, the machine to produce the design object. There was a hierarchical categorisation between engineers (first named) and designer (always at the second position named).
When creating today in the automotive industry, the textile industry, the fashion industry and other disciplines, we utilise different analogue and digital, and in combination, analogous digitalised methods for computer aided design (CAD) processes. Analogue experiences of a 1 to 1 models, or smaller scale models and prototypes are necessary to optimise and to perfect the products. In combination with 3-D printers and other small-scale machines in the 21st century today, the come back is reasonable to underline again the economic factors time and space, and in addition the driver and minimised source key factors of sustainability and the circular economy. However, the circular economy and the commitment to profit are not the only drivers for new designs, new products and services. Since John Elkington's Triple Bottom line focusing on Profit – People – Planet, there is a new perspective possible for far-reaching responsibility in a holistic approach towards sustainability. For production and management processes in industry this means of course a non-hierarchical structure of developing, producing and retailing objects and services in the future. This means that a future will not be generated with a linear or circular economy, but with a complex system with a non-hierarchical economy in which all participants could influence the industrial process; the entrepreneur, the worker, the designer, the general public, the expert, the scientist, the child like figure 1 (cf. fig.1) is demonstrating. These non-hierarchical design lines offering and of cause demanding earlier respect of educational and pedagogical impact of product engineering and design projects at school as well project integrated people of retirement: in interdisciplinary and intercultural, inter sociological design projects, communicating and generating via digital and analogous media. This gives advantages for the creation of the future but also involves disadvantages. It does, however, create new frameworks for design + engineering education.

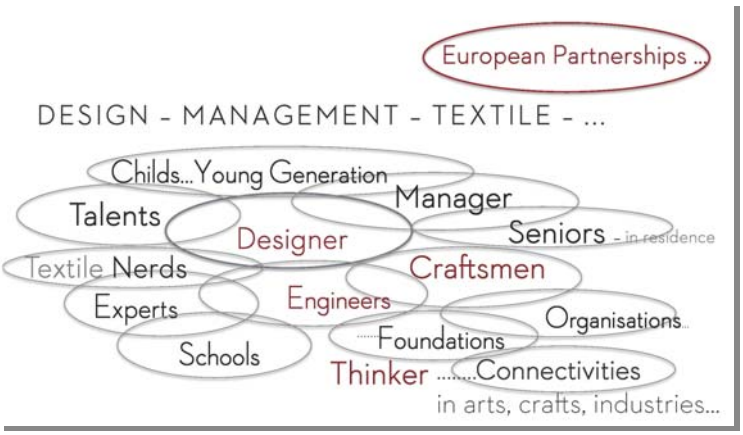

Figure 1. Participations of an interdisciplinary and intercultural non-hierarchical structure in design education tomorrow, Design: Wachs, M.-E., 2018

5 THE DESIGN TURNAROUND AND DIGITAL REVOLUTION: A DESIGN SHIFT

5.1 Digitalisation as a digital revolution and de-industrialisation – consequences for design education

"De-industrialisation" (Bärtschi, Hans-Peter, 1998) [7] and digitisation in industry 4.0 are the dominant parameters for drivers in industry today, in both in textile-producing companies and for

metal processing and producing brands. The focus lays on changes by means of construction parameters and design methods. Design thinking is a matter of subsequent dematerialisation on both sides. When producing and creating in design + engineering, interdisciplinary and intercultural teams are the future. Transfer of production processes into the post-industrial area within a digital world is related to cultural behaviour and is therefore also in a behavioural framework of human beings. Technology transfer is usually interpreted within the context; the transfer of a technology from one societal or cultural context to another and from a higher developed to a less-developed space. [1] The cultural context is first within the university itself created, setting sciences in a theoretical context, but otherwise outside by establishing cooperation projects with companies, experts and talents in European countries. With regard to the textile design heritage, there are so called *lieux de mémoires* (Nolte, P.), places of memory, which collect the know-how of great experts, and attract new experts as well as advanced research commitment. The interdisciplinary and intercultural design projects *Textile Archisculpture* and *Textile Traces* (Wachs, M.-E., 2017 and 2018) enhance the circle of mixed teams of European talents and experts from textile centres with a great textile heritage - Manchester (GB), Borås (Sweden) and Mönchengladbach/Krefeld (Germany). Young European students and experts creating the textile future in a hybrid space with dynamic design studies; both analogue and digital, with conventional design methods such as field studies but also with modern design methods of design thinking, transformation design and design scenario stretching. The following design studies representing heritage communicating via design and entrepreneurial university at the same time: KURT - simple, solid, smart: the textile heritage of Krefeld inspiring sports couture and textile architecture, by K. Amprazi; Dampfenergy – relax and stretch: a fashionable yoga machine, by K. Grobheiser. The design studies focus on advanced sustainable textile design solutions for fashion and *archisculptural* design with high engineering standards. A comparison to the European textile network – within intercultural textile design studies – is in focus for 2019.

5.2 Sustainable education and working conditions as a factor influencing the need for analogue AND digital education-based areas.

The digital revolution at the beginning of the 21st century is the reason for a “design shift” (Wachs, M.E.) [10] and for a need for more sustainable thinking [11] in design and in design education. The change of industrial production processes within the fourth industrial revolution (Schwab, K., 2016) [12] stands in relation to a change of design methods and vice versa: It is also a question of the evaluated design objects and parameters of the circular economy as proof of the change in correlations between different corporate identities; of People - Things - Regions, that creates new potential for new drivers of sustainable industrial design systems in a non-hierarchical structure. This discussion will include members of the industry, the universities and the new younger generation at school for the next decade at least. The consequences for production places and industrial conditions – if we could subsequently use the terms “industry” and “industrial” – is accompanied by identification with values such as sustainability and long-lasting products and sources. Communicating heritage as a management tool goes hand in hand with communicating tradition (Bühler, H et al) [8] linked to life experiences, to places and patterns of the individual [13], but still socially relevant within brand management and indeed entrepreneurial universities in the future.

Design studies are currently focusing on textile and engineering design identities in relation to education and workplaces with regard to history and the future. To specify “sustainable design studies” for the future, the thesis puts forward the case for different design education at school, more effective intercultural connections between universities and teams on the European continent and for creating a *mobile task force* of talented designers to come around to a sustainable way of thinking and acting in design in order to be able to understand that sustainable design creates sustainable long-lasting life conditions. The techno science perspective is only one possible way of looking at the next design and engineer drivers of mixed teams in thinking *togetherness* (Sennett, R., 2012). Within the digital revolution, cooperative analogues and digital working conditions and design methods of design thinking, an interdisciplinary an intercultural area comes into life. A *dialogical thinking* comes into play in thinking designs future, comparable to Sennett’s picture in 2012 related to the philosopher Montaigne and to the sociological argumentation by Heuser et.al. in 2018 meanwhile discussed from the point of sociological views within the next digital educational area. [14]

The next design generation is *sketching* a sustainable design culture for a digitalised and interculturally connected society but which is still localised in relation to the People – Things – Stories of our future

cultural heritage. Stories and scenarios created by human beings are the next driver for sustainable design culture as the result of a *design shift* (Wachs, M.-E. 2018).

REFERENCES

[1] Skibo, J.M. and Schiffer M.B. *People and Things – A Behavioural Approach to Material Culture,* 2009, p. 9 ff and 127 f, (Springer).

[2] Bremm, K.-J., *Das Zeitalter der Industrialisierung,* 2014, p. 12 and others (Darmstadt).

[3] Funken, Chr. *Sheconomy- Warum die Zukunft der Arbeitwelt weiblich ist,* 2016 (C. Bertelsmann)

[4] Bachmann-Medick, D., *CULTURAL TURNS – Neurorientierung in den Kulturwissenschaften,* 2007 (2006), (Rowohlt Verlag).

[5] Epstein, St. A. *An Economic and Social History of Later Medieval Europe, 1000-1500,* 2009, p 212 ff, (Cambridge University Press).

[6] Bolenz, E. et al. *Die andere Schönheit – Industriekultur in Nordrhein-Westfalen,* 2010, (Greven Verlag Köln).

[7] Channell, D.F., *A History of Technoscience – Erasing the Boundaries between Science and Technology,* 2017, p.256ff, (Routledge, London).

[8] Bühler, H. and Dürig, U.-M., *Tradition kommunizieren – Das Handbuch der Communication Heritage, Wie Unternehmen ihre Wurzeln und Werte professionell vermitteln,* 2009 (Frankfurter Allgemeine Buch)

[9] Liedtke, R., *Die Industrielle Revolution,* 2012 UTB-Band 3350, (Böhlau Verlag).

[10] Wachs, M. E., *Textile Trace and Industrial Design,* 2018, Proceedings and following publication end of 2018 to the conference Textile and Place, (Manchester School of Art/ The Whitworth).

[11] Meffert, H. and others, *Sustainable Marketing Management,* 2014, (Springer Gabler).

[12] Schwab, K., *The Fourth Industrial Revolution,* 2016 (The World Economic Forum).

[13] Wachs, M. E., *Material Mind – Neue Materialien in Design, Kunst und Architektur,* 2008, (Dr. Kovac).

[14] Sennett, R., *Together – The Rituals, Pleasures and Politics of Cooperation,* 2012, (Yale, University Press).
ibid: Heuser, J.-U., et al, *Was machen wir morgen? Wenn durch künstliche Intelligenz Arbeitsplätze vernichtet werden, steht Deutschland vor einer Herausforderung. Zerbricht die Gesellschaft daran? Oder gibt es wieder Zeit für die wichtigen Dinge?,* in: Zeitverlag Gernd Bucerius GmbH, DIE ZEIT, Nr. 18, 26 of April 2018, p. 25 ff.
Others: Assmann, J., *Das Kulturelle Gedächtnis,* 2012, (Becksche Reihe).