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Climate Change and a Circular Economy:
Challenges Facing Ceramicists

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Challenges Facing Ceramicists

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(6,596 words)

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Abstract

In this essay, the impact of climate change and the need for a circular economy to reduce carbon emissions are first investigated. Views of leading international economist, Jeremy Rifkin, are supported by Alan Murray, Keith Skene and Kathryn Haynes in defining the context of this theory. William McDonough and Michael Braungart's regenerative design approach, termed 'Cradle to Cradle', is also compared to the closed loop lifecycle model promoted by the recently established Ellen MacArthur Foundation.

The challenges facing ceramicists to reduce their carbon emissions within a circular economy, are then evaluated in three sections. Case studies are first used to assess the practicalities of sourcing virgin raw materials and energy. The European Ceramic Industry's Road Map to 2050 evidences important actions being taken by industry. Theories from key authors regarding reusing and recycling are then analysed; McDonough and Braungart question this approach, as does Jonathan Chapman, who advocates emotionally durable design. Their views are juxtaposed with Michael Thompson's recently renewed rubbish theory, supported by further case studies.

Increasing durability through emotional design is finally assessed through the perspectives of Stuart Walker, an expert in environmental and sustainable design. His views on making material culture meaningful are compared to those of David Pye, an iconic and influential industrial designer and craftsman. With references from Chapman and Rifkin, the contribution technology has played in encouraging a disposable society, and the basic human need for ownership as a challenge to a sustainable circular economy, are discussed.

Conclusions suggest ceramicists face complicated challenges in reducing carbon emissions. Applying circular economic theory is a positive strategy to investigate effective practices, however, reusing and recycling have their limitations. Creating emotionally durable designs is proposed as the best response to the challenges of keeping products in the closed loop lifecycle. Ceramicists need to continue researching and experimenting ways to reduce the impact of their individual practices. This will contribute to the worlds collaborative efforts to reverse the effects of climate change and enhance human well-being.

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Introduction

In the city of Cairns, Australia, on the 27th and 28th November 2018, temperatures reached a record-breaking 42.6°C (BBC Climate Change – The Facts, 2019), and an estimated 23,000 flying-fox bats died of fatal heat stress. Previous research by Welbergen et al, (2007), has shown how flying fox ‘die-offs’ increase as temperatures escalate, threatening bat-related eco-systems, as bats pollinate crops and promote seed distribution. Dr Justin Welbergen, lead researcher and ecologist at Western Sydney University, believes these deaths are underestimated and describes flying-foxes as ‘the canary in the coal mine for climate change’ (Mayo, 2019).

The deaths of flying-fox bats are just one of many examples of today’s eco-consequences of climate change, which demonstrate how the world needs to accelerate its efforts to reduce these impacts. According to international economist, Jeremy Rifkin, (2019, p.1-7), statistics on global warming as a result of human activity (produced by the Intergovernmental Panel on Climate Change (IPCC) in 2018) predicted that a temperature rise of 1.5°C (Celsius) above preindustrial levels would cause a disastrous tipping point for the earth’s ecosystems. With levels currently at 1°C above, Rifkin states the world needs to go faster in transforming the current global economy to a post carbon era.

One of the solutions for designers and crafters to reduce their carbon emissions is to operate within a circular economy. Ellen MacArthur Foundation (2017) explains this involves moving from the current linear model, based on take-make-waste principles and planned obsolescence, to reducing the use of virgin raw materials, eliminating waste, and keeping products in a closed loop life cycle by reusing, recycling and increasing their durability. Re-evaluating product life cycles makes economic as well as environmental sense, as cost savings can be identified and environmentally friendly products can enhance sales, by giving the consumer a feeling of well-being.

However, consumers are faced with a no-win choice in the purchase of most current products available, as all products contribute to carbon emissions in some way. This creates anxiety for consumers, especially as increased media reports and worldwide protests by the younger generation (Rifkin, 2019, p.7.), have highlighted the consequential loss of species and threats to the biosphere.

The challenge specifically facing ceramicists was articulated by the Crafts Council in their report in 2012, which highlighted 'some of the most significant craft disciplines, such as ceramics and glass, use methods (firing and glazing) which are not environmentally friendly but which cannot be readily replaced in current practice.' The extent to which ceramicists can reduce their carbon emissions through sustainable practice in a circular economy, is therefore the focus of this essay.

The journey begins by putting a circular economy in context. In three further sections, reducing virgin raw materials and energy are considered, followed by reusing and recycling ceramics and finally creating durable designs at the outset. The main challenges facing ceramicists in operating within a circular economy are analysed and evaluated throughout and conclusions proposed.

For the purposes of this essay a ceramicist is defined as: 'one skilled in making pottery; a ceramic artist' (Oxford English Dictionary, 2019) and ceramic is defined as 'made of clay and permanently hardened by heat' (Lexico, 2019a). The term 'product' refers to 'an article or substance that is manufactured or refined for sale' (Lexico, 2019b).

Chapter One - A Circular Economy in Context

It is important to understand that a circular economy forms part of the vision of the Third Industrial Revolution. Now adopted by the European Union (EU), the People's Republic of China and endorsed by the United Nations (UN), Rifkin (2019, pp.15-19) states how a societal shift to the Third Industrial Revolution first emerged in the 1990's.

Rifkin (2019, pp15-19) suggests, historically, economic shifts which create a gear change in society-wide infrastructures, have occurred when communication, energy and transport technologies have combined.
He believes the First Industrial Revolution, combined printing and the telegraph with coal and rail, and the Second Industrial Revolution combined telephone, radio and television with oil and extended road systems. The Third Industrial Revolution will combine today's digital communication and renewable energy technologies with electric transport and envisions a shift to a sharing, circular economy within society.

Rifkin considers it is this combination, using the connectivity of the Internet of Things (IoT), which will allow the global economy to fully disengage from fossil fuels to deliver a carbon-zero sustainable future for the planet. It is also important to acknowledge Garcia-Munia et al (2018), who single out the IoT as the Fourth Industrial Revolution or Industry 4.0, which 'exploits different technologies that allow you to connect to the Internet any type of device'. According to Euchner (2018, p.11), the IoT envisions a 'future in which trillions of connected devices serve billions of connected people', enabling the democratisation of many processes.

Although theories relating to the Third Industrial Revolution and climate change have been in existence for many years, society has been slow to acknowledge them. Murray et al (2017), argue the background of a circular economy started in the 1980's, when the UN wanted to envision a long-term environmental strategy for a sustainable world in the 21st century. However, predominantly Western governments continued to focus on neo-liberal economic policies, leading instead to increased consumption and waste, abuse of natural resources and higher carbon emissions. Despite enhanced business reporting on corporate social responsibility and increased sustainability information, there has been a delay in recognising the need for change.

As a result of disposable culture, eighteen years ago, McDonough & Braungart (2002, p.10) espoused that designers should instigate a paradigm shift; reversing the take-make-waste consequences of excess consumerism and a throw-away lifestyle, and embrace a zero ecological footprint, designing products to have zero waste and emissions.

Their Cradle to Cradle term, adopted from Walter Stahel (Ellen MacArthur Foundation, 2017), named a philosophy in which products remain constantly in circulation. Today, the Ellen MacArthur Foundation (2017), calls it a circular economy, where products are designed to exist in a closed loop life cycle. This ensures minimal use of earth's resources, as products are used and reused continually and sustainably with no waste, optimising decarbonisation, economic development and the seventeen UN Sustainable Development Goals.

When analysing the challenges facing ceramicists and the extent to which they can mitigate their impact on the environment, it is important to make clear the main elements of a circular economy, which provide the structure for the following chapters. Although there are variations, Murray et al, (2017) describe them as using a combination of industrial symbiosis, where manufacturers work in collaboration to exchange use of waste materials, and a focus on the three R's of Reduce, Reuse and Recycle to keep products in a closed loop lifecycle.

In addition, although proposing regulation should not be needed with effective design, McDonough and Braungart (2002, p.53) argue a 4th R - 'Regulate', to recognise government policies and laws, needs to be in place to secure the other 3 R's. For example, Murray et al (2017) quote recycling laws in Japan (The Basic Law for Establishing a Sound Material-cycle Society, 2002) and Germany (The Waste Avoidance and Management Act, 2002). At the same time, research shows some companies also include further R's; for example, Renew (Michelin, 2019), Repair (Arco, 2019) and LinkedIn (2019), have developed a 7-R model with Refurbish, Recover and Rethink in the mix (Fig.1.).

Still, in today's business world, Murray et al (2017) say, 'economic sustainability is often found to be privileged over environmental and social and over moral and ethical values.' This suggests the concept of a circular economy is needed as a relevant framework to support corporations and societies confront the wider challenges of targeting emissions and enhancing community well-being.

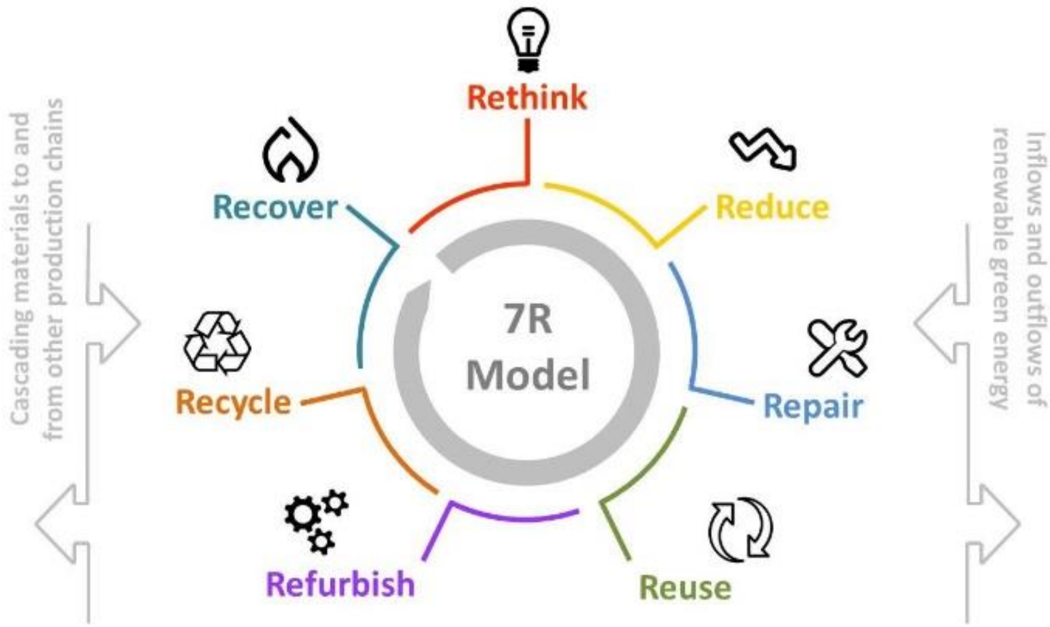

Fig.1. The LinkedIn 7-R Model

While governments, corporations and societies are beginning to act, it is also essential the individual recognises the part they can play in reducing carbon emissions. Reinforcing this, Scottish ceramicist, Kevin Morris (in Craft Scotland, 2018) urges:

> ‘There is no doubt that the impact of the individual maker is minimal compared to that of industry, however, it is every makers’ collective responsibility to evaluate their process and attempt to minimise our impact on the environment.’

Challenges facing ceramicists to reduce virgin raw materials and energy are now considered.

Chapter Two - Reducing Materials and Energy

According to the Crafts Council (2012), a survey analysis found 31% of crafters overall, of which ceramicists made up 25%, changed their practice in the years 2009-2011 due to eco-concerns. This was done mainly by sourcing materials which were more considerate of the environment and practising in a more sustainable way. This chapter shows how individual ceramicists, and those collaborating with industry, are further responding to the challenges of reducing carbon emissions within a circular economy.

Regarding materials, it is first necessary to confront the dilemma put forward by Wijkman (Ellen MacArthur Foundation, 2019), who says 'every time we put a plough in the land carbon is released'. The aim, therefore, must be to reduce impacts, as it is impossible to completely source virgin raw materials for the processing of clay and glazes without contributing to carbon emissions. The European Ceramic Industry (Cerame-Uni, 2015) specify they reduce their emissions by returning clay extraction sites to their original state when mining is completed, to protect biodiversity and sustain local communities. Despite this, emissions are still created using energy in processing and transporting clay materials (How It's Made, 2015). This suggests ceramicists need to employ a combination of local sourcing and waste management strategies to reduce emissions, based on the concept that 'waste equals food' (McDonough and Braungart, 2002, p.92).

In the 17th century, before the expansion of transport and communication systems, the development of Wedgwood in Staffordshire illustrates how local sourcing of ample supplies of clay and coal minimised their costs and effects on the environment (Blake-Roberts, 2014, p.6). In another example, internationally acclaimed Australian ceramicist, Janet Mansfield, benefited from digging the rich local clay on her farm and collecting fallen wood to fuel her kiln (Harrison, 2013, p.7). However, local sourcing is not always possible or desirable for today's urban ceramicists, unless specific initiatives are taken. For example, London-based Alison Cooke (2019), successfully sourced local clay spoil from the London Bridge Network Rail construction site for her exhibition at Southwark Cathedral in 2017 (Fig.2.). Nevertheless, the extent to which ceramicists can reduce transport emissions is partly dependent on the distribution of clay suppliers and their proximity to ceramicists studios.

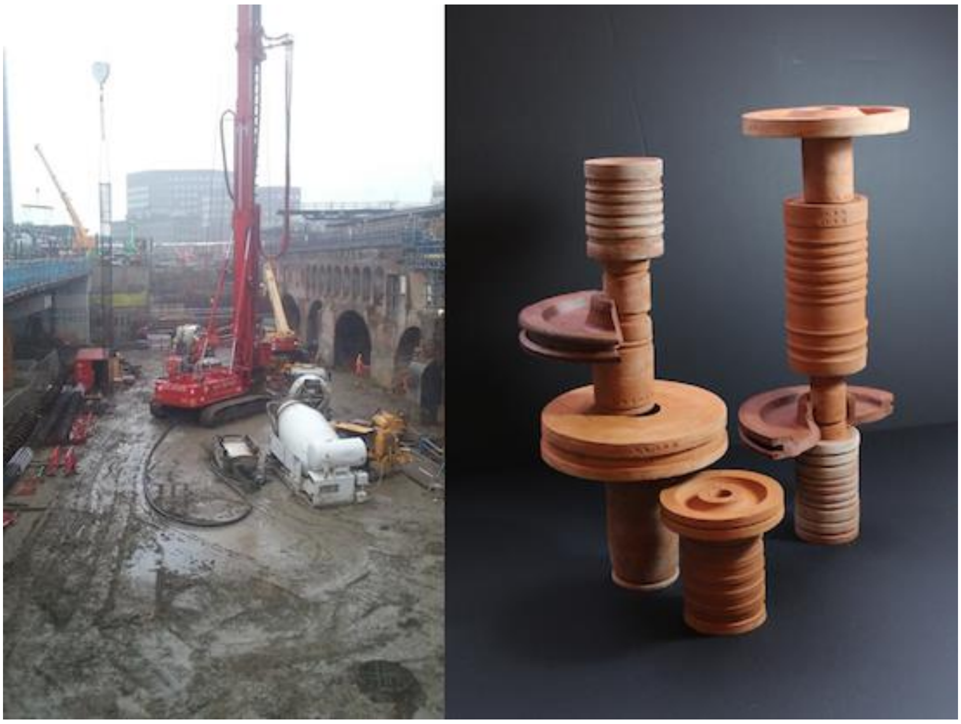

Fig.2. Construction site, Southwark Cathedral exhibition, Alison Cooke

Regarding waste management, Morris (in Craft Scotland, 2018) suggests reclaiming, reusing and recycling clay from studio waste materials is the simplest way to save carbon emissions. Sourcing waste raw materials from other closed loop life cycles is more complicated. However, despite technical and financial challenges, pioneering work is being carried out in the UK and abroad. For example, Hitti (2019a), reports artisan ceramicists from Granby Workshop in Liverpool have conducted scientific experiments with local ceramic waste management companies to successfully produce ceramic tableware from 100% recycled ceramic waste materials.

Two further examples of this industrial symbiosis also illustrate effective use of waste materials. First, Lithuanian ceramicist, Agne Kucerenkaite produces tableware from powdered dyes made from local industrial metal waste mixed with porcelain clay, (Hitti 2018). Second, R.E.D. designers from the Royal College of Art worked with ceramicists and material scientists to successfully create slip cast tableware (Fig.3.) using bauxite tailings from aluminium production in the South of France (Hitti, 2019b).

Demonstrating how diverse waste experimentation can be, Yalcinkaya (2019) reports how Royal College of Art student, Sinae Kim, successfully distilled minerals from human urine to create a natural glaze (Fig.4.), which is more sustainable and safer to use than commercial glazes.

These examples show how sourcing sustainable alternatives to virgin raw materials can be achieved by re-evaluating waste products and thus emphasises how investment in research and development can reduce carbon emissions.

Fig.3. Slip cast tableware, R.E.D.

Fig.4. Urine glazed vessels, Sinae Kim

There are clearly differences in opportunities for industry and individuals to source waste raw materials from within the closed loop. On the one hand, the European Ceramics Industry is already leading the way; Johnsons

Tiles in the UK use a minimum of 20% recycled ceramic materials in their products (Johnson Tiles, 2019) and Roca, a global brand based in Spain, have incorporated up to 80% recycled material in their Green Earth tiles (Almeida and Sousa Simoes, 2016). On the other hand, UK ceramicists cannot yet source commercially produced clay bodies containing 100% recycled materials from main clay suppliers, such as Scarva (Fitzpatrick, 2019). This further demonstrates the current gap which industry could help close by continuing to invest in waste material research and encourage the efforts of individual ceramicists.

Using alternative technologies such as 3-D printing can also reduce use of virgin raw materials. Rifkin (2011, p.117) points out that this additive-termed process reduces use of materials by only printing what is needed. This is opposed to subtractive manufacturing, which creates waste by taking away material to leave the finished product. However, ceramicist, Johnathan Keep (2019), an expert in 3-D printing with clay, acknowledges difficulties in the process and admits not many students continue using this method in their work. This technique reduces energy costs; however, energy is still required for firing.

Reducing energy, and therefore carbon emissions from kiln firings, is the biggest challenge facing ceramicists. The main ways are reducing the temperature, length and number of firings, using a reliable source of renewable energy, investing in an improved kiln design, maintaining and running the kiln efficiently (Harrison, 2013, p.136).

Reducing energy by eliminating the bisque firing stage is termed once-firing. Ceramicist, Dame Lucie Rie, mostly pioneered once-firing in the UK in the late 1940's using her electric kiln. She advocated it caused a 'more intimate bond between clay body and surface additions' (Cooper, 1994, p.30). Although high-firing to stoneware and slowing the firing down, once-firing afforded her savings in costs and emissions, without compromising her creativity.

Cerame-Uni (2015) cites a producer of hotel tableware in the UK, who reduced emissions by 79% by changing to once-fire at lower temperatures. Independent businessman, Richard Miller (2019) of Froyles Tiles, is a further example; he raw glazes and once-fires all his tiles to 1280°C and is investigating solar panels for his electricity supply. Although there are challenges in raw glazing fragile greenware, and once-firing can have a higher failure rate in the kiln, Tristram (1996, p.40-49) recommends once-firing is 'quicker, cheaper, more direct, more efficient, more pleasant to the touch and keeps the creative concept fresh in the mind and hands'. Recognising this method is not suitable for every process, such as applying engobes in early work produced by Walter Keeler (Tristram, 1996, p.44), once-firing does reduce carbon emissions.

Choosing a renewable energy provider also reduces emissions, although renewable technology still needs to be developed to directly power kilns. Regarding solar, research by ceramicists Iain Howlett and Maria Dragonmirova at the Royal College of Art, discovered solar powered kilns were difficult to get up to temperature, only reaching 700°C, instead of the 1200°C they need for firing (Wustemann, 2019). However, Cerame-Uni

(2015) reports Spanish industrial research is considering drying ceramics using solar ovens, needing to reach up to 300°C, as well as higher temperature kilns. Also, solar panels have been installed on some ceramic factories in Valencia, which hosts 95% of Spain's ceramic tile industry, demonstrating again the importance of developing renewable technologies such as solar to aid energy reduction.

The source of fuel has also been considered by American ceramicist, Denise Joyal (2011), who calculated the carbon footprint of various kiln types with different fuel sources, using greenhouse gas accounting methods developed by the IPCC. She confirmed electricity has at least a tenth of pounds of carbon emissions per unit over all fuel types, including gases, oils and wood, with wood being the highest. This presents a challenge for ceramicists who prefer the aesthetic results of wood-firing, especially as Gulland (in Joyal, 2011) says, 'On a scale of carbon neutrality, burning wood is better than burning a fossil fuel, but it's not the same as wind or solar.' David Wright (2019) offers an alternative solution, believing his use of broken and non-returnable wooden pallets sourced from a local building supplier, delivers carbon reduction as the pallets would otherwise end up in landfill, thus using waste from one industry to fuel his own. In her assessment of kiln types, Joyal (2011) showed how complicated it is to determine the best way to reduce emissions from firings overall, due to the many factors involved, such as the number of kiln chambers. However, the fact that multiple solutions are being investigated demonstrates how the ceramics industry is aware of the changes that need to be made to reduce emissions.

Upgrading kilns to more efficient energy sources reduces carbon emissions but presents an investment challenge. Cerame-Uni (2015) report as industrial kilns can last up to 40 years, there are significant financial constraints in upgrading kilns before the end of their life, due to the significant investment cost. Although the European Ceramics Industry has a long-term plan to reduce emissions by 2050, (Cerame-Uni, 2015), they specify legislative and financial support is required from governments to convert kilns to deliver these targets. The same dilemma applies to the craft ceramicist regarding investment. However, practicing effective kiln maintenance can reduce emissions by keeping the kiln in use for longer (Sievers, 2015).

Finally, ceramicists can reduce emissions in their practice by maximising the sustainability of their studio and efficient use of water (Harrison, 2013, p.64, p.76). However, as they cannot reach carbon-zero, one option to compensate for any emissions is by carbon offsetting. This is where the cost of a carbon footprint is calculated and a subsequent donation is made of an equivalent amount, which reduces emissions elsewhere (United Nations, 2018). One such approved UN charity to receive donations is Ripple Africa (2019), who fund fuel-efficient clay cookstoves in Malawi to slow deforestation (Fig.5.). This extra expense is a challenge to ceramicists, especially when, according to a survey by the Crafts Council (2012), over 50% of crafters report net profits of less than £5,000 per year. Carbon offsetting has also been criticised as 'greenwashing' by environmentalists, who say it is not effective in stopping emissions at their source, as evidenced by recent controversy in the airline industry (Powley et al, 2019).

Fig.5. Fuel-efficient clay cookstove in Malawi

As shown, the extent to which ceramicists can reduce virgin raw materials and energy, operating within a circular economy, reveals a complicated range of responses. While innovative attempts are being made by some individual ceramicists, the majority are limited in being able to source waste raw materials commercially, 3-D printing is not a popular choice and energy reductions have wider cost implications in changing fuel sources as kilns have long lifecycles. However, ceramicists can still adapt their individual practices to mitigate emissions, offset where necessary and consider reusing or recycling ceramics as discussed in the next chapter.

Chapter Three - Reusing and Recycling Ceramics

Reusing or recycling means keeping products in the closed loop of a circular economy, thus reducing emissions. In this chapter, contrasting views, rubbish theory and relevant case studies demonstrate challenges confronting ceramicists trying to increase the value of reused and recycled products, while reducing emissions.

The practice of recycling attracts controversy, so it is necessary to consider the issues. Chapman (2015, p.169) argues there are 'complex and numerous hypocrisies' within recycling, which maintains demand as consumers continue to purchase recycled products, marketed as environmentally friendly, instead of simply reducing their purchases.
A further perspective is offered by McDonough and Braungart, (2002, p.69), who also recognise complications in recycling having a carbon footprint of its own and thus leading to potentially greater emissions or waste in production. These views reinforce concerns about waste's panacea, suggesting recycling might not always be the solution it is perceived to be.

However, upcycling is one possible recycling design strategy, where upcycling is defined as; 'Reuse (discarded objects or materials) in such a way as to create a product of higher quality or value than the original' (Lexico, 2019c). In the current Anthropocene, where richer western civilisations have over-produced, a revival in upcycling ceramics is a seen as a sociological response to create new works; Veiteberg (2011, p.25) says, 'the world is already full of objects and many people see it as a moral dilemma to add even more'.

Nevertheless, ceramicists are also challenged by the debate over the value of upcycling; on the one hand, McDonough and Braungart (2002, p.56.) believe any kind of recycling to be downcycling, as it ‘reduces the quality of a material over time’. On the other hand, in defence of upcycling when discussing Rubbish Theory, Reno (in Thompson, 2017, p.vi), argues 'no object is fated to remain relegated to a particular category of value' and Chapman (2015, p.51) agrees that ‘change is the only constant’. This recognises the value of an object over time, where according to Thompson (2017, p.4), objects are elevated from transient to durable via a rubbish category (Fig.6.). This suggests the more durable an object is, the more valuable it is.

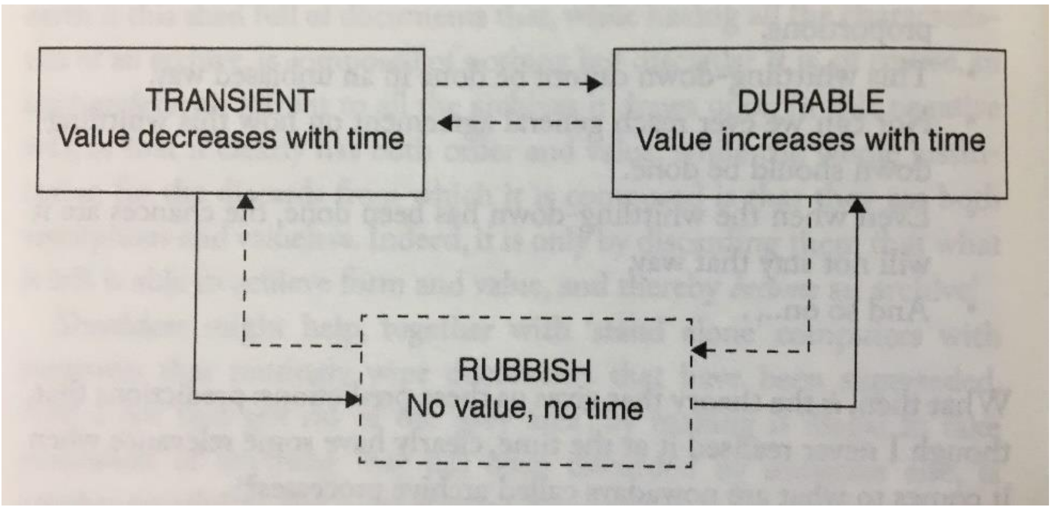

Fig.6. ‘The Basic Rubbish Theory Hypothesis (The solid arrows are the transfers that happen; the broken ones the transfers that do not happen, because they contradict the value and/or time directions that define the various categories.)’ (Thompson, 2017, p.4)

Further psychological reasons why objects move from rubbish to durable and become desirable, as in upcycling, are provided by Xue & Kajala (2019), in a deeper analysis of Rubbish Theory. They examine Memory Retrieval – Nostalgic Product Experience Model, where objects evoke emotional value through associations with the past. Renaming the categories of transient, rubbish and durable to memory formation, provisional oblivion and memory retrieval, Xue & Kajala, (2019), explain how objects are perceived in relation to personal experiences, suggesting the more relevant an object is to a person's experiences, the higher value it will have.

This way of establishing a connection to an object to increase its value was successfully interpreted by Paul Scott. He upcycled a series of plates and dishes called 'Spode Works Closed' in 2009-10, by salvaging wasted wares found at the decommissioned Spode site in Stoke on Trent (Scott, 2017).

Here, the challenge was using further energy in production, as the works were re-fired to give additional meaning; either fusing a layer of the original factory dust into the glaze, or adding gold lustre gilding to seal the cracks, or adding a decal logo 'Spode Closed' (V&A, 2019). Nevertheless, in triggering a sense of nostalgia, 'the resulting poetically-charged object memorialises the once-great Spode factory' (V&A, 2019). The fact that his work is now displayed in the Victoria and Albert Museum (Fig. 7.), evidences how the value of recycled ceramics can be increased.

Fig.7. Casserole Dish from *Spode Works Closed,* Paul Scott

A similar example is provided by mudlarker, Robert Cooper, who upcycles ceramic shards collected from the Thames foreshore into candlesticks, as shown by ‘Tripod’ (Fig. 8.). Cooper (2017, p.68) reduces emissions as his work combines other recycled ceramic waste materials from his studio, joined with glue and concrete and is most importantly, unfired. His candlesticks tell a nostalgic story about the social and cultural history of the London Potteries of the 17th -19th centuries. With both physical and emotional connections, he can successfully create ‘new narratives with multiple meanings’ (Cooper, 2019). Sandling (2016, p.137) also emphasises how physical connections with shards can arouse a ‘deep and unsettling feeling, to place your thumb where a potter four hundred years ago placed his’.

Having existential feedback by touching found objects gives a deeper sense of meaning to the objects which enhances their durability.

Fig.8. *Tripod,* Robert Cooper

A further way to increase an object's value is to upcycle for dramatic effect, as Duchamp demonstrated by elevating a porcelain urinal to art status in 1917. However, Veiteberg (2011, p.16) suggests artists subsequently designing ready-mades for disruptive effect have less of a shocking impact, as the concept has become too familiar.

Despite this, Britton (as cited in Veiteberg, 2011, p.31.), explains how the huge scale of Clare Twomey's installation, 'Monument', successfully confronted the visitor with a shocking amount of waste, stimulating both physical and emotional reactions to is size and obsolescence. It was inspired by broken ceramic tableware to create a heap of rejected waste crockery and shards from the British ceramics industry, which was curated in Holland (Fig.9.), then moved to the Middlesbrough Institute of Modern Art in 2009 (Fig.10.).

Fig.9. *Monument,* Claire Twomey

Twomey (2009) describes how the artwork questioned how products are appreciated, cared for and valued. Although upcycling to art status was applied here, and no energy was used in firing, energy was used in transporting the vast amount of ceramics from Johnsons Ceramics Tile Factory in the UK to Europe and back, and in the subsequent decommissioning. Therefore, although upcycling, in the context of a circular economy, a reduction in carbon emissions can be questioned, representing one of limitations of recycling, mentioned previously by McDonough and Braungart.

Fig.10. *Possibilities and Losses*, Clare Twomey

As shown, the challenge for the ceramicist in reusing and recycling objects to create upcycled artworks can present a paradox; although an object might increase in value, it might also increase carbon emissions in its creation. Upcycling has varying degrees of success in reducing carbon emissions, with Cooper's work being the eco-friendliest and Twomey's work the least. They all, however, employ an element of emotional connection in their work to increase its value and durability. How emotional connections can be employed to extend a products life within a circular economy are further considered in the next chapter.

Chapter Four - Designing for Emotional Durability

Ceramic material is physically durable and increasing a product's emotional durability can further help ceramicists reduce carbon emissions by encouraging their products to stay in the closed loop lifecycle. Key theories presented here by Walker and Pye are evaluated with relevant case studies to demonstrate this. The impact of technology in relation to emotionally durable designs and their place in a future sharing economy is then considered.

Walker (2006, pp.40-41) believes an object increases its durability when it makes a connection or has meaning and analyses reasons why objects stand the test of time. He states durable qualities are mirrored in, and broadly meet, Maslow's hierarchy of human needs (Fig.11.), where: functional usefulness meet physiological and safety needs, expressions of status or identity meet belonging/love and self-esteem needs and those having a spiritual or inspirational role meet self-actualisation needs.

Fig.11. Maslow's Hierarchy of human basic & psychological needs

This appears to suggest a product can be perceived as more durable when meeting higher self-actualisation needs; where there is a deeper psychological meaning in the product. Further increases in depth of meaning can occur when multiple needs are met. Walker (2006, p.51) says 'it is only by attempting to make our material culture meaningful that we can hope to contribute to sustainable future'.

Fig.12. *The Toddler,* Beverly Mayeri

To establish deeper meanings, Chapman (2015, p.25) explains artworks often pose questions, establishing an emotional connection between artist and audience. In her ceramic and acrylic sculpture, The Toddler (Fig.12.), ceramicist, Beverly Mayeri, asks the audience to consider its own interpretation of the link between man and pollution; 'The child wants to be lifted out of the dark water of our pollution and excesses into a better, brighter future. But is he plugging up the bathwater or letting it drain?' (Schwartz, 2008, p.215). This symbol of environmental fragility stimulates an emotional response from the audience, giving the sculpture value, thus promoting durability.

A similar theory about increasing a product's durability through its inherent meaning, was presented by Pye (1995, p.83-84), who quoted Ruskin; 'If we build, let us think that we build forever', where the maker strives for the highest quality craftsmanship and the owner therefore cares and looks after it. Pye gave three definitions of emotional durability, the first of which being: products designed to be inherited, which provide a link to speak from one generation to another, so they can learn about the past.

To demonstrate this, a Chinese teapot (Fig.13.), owned and handed down by a family for generations, was recently discovered to belong to the Chinese emperor Qianlong who reigned between 1736 and 1795 (Telegraph Reporters, 2019). Despite a cracked lid, it sold at auction for £1m in November 2019, thus showing the benefit of keeping and looking after ceramic heirlooms. Its exceptional craftsmanship as a historical Imperial masterpiece sealed its value, as well as the Chinese need to buy back part of its heritage.

Fig.13. Chinese teapot

De Waal (2010, p.17) offers a further perspective on his inherited collection of netsuke, saying ‘how objects are handed on is all about story-telling’, suggesting that value is more than the objects themselves; it is about the history that is revealed behind the objects.

Building collectability and philanthropy into a range can also provide an emotional incentive to buy and keep objects within a circular economy scenario. For example, Morris (2018, p.235.) describes Charlotte Pack’s small-scale slip cast porcelain and parian vessels, titled Species Pots (Fig.14.), as having a different hand-built endangered animal on top. Although prices range between £180-£530, 15% of sales are donated to wildlife conservation projects around the world (Charlotte Mary Pack, 2019), providing a strong charitable appeal.

Fig.14. *Species Pots,* Charlotte Pack

Secondly, Pye (1995, p.83-84) defines emotionally durable products as those that can be maintained or repaired and enable their owners to appreciate and benefit from their longevity, thus having the time and money to spend on other things. This is demonstrated by kintsugi, a Japanese technique to repair broken ceramics using a natural resin called urushi and gold and silver powders, elevating them to a higher value. Kaniskan (2018, p.162.) believes this technique to be based on the philosophy of Japanese Zen Buddhism, in which cracks and flaws are considered valuable; highlighting these weaknesses gives the reincarnated form added value by using precious metals.

Keulemans (2016) contrasts this with the Western tradition of valuing invisible repair, which hides imperfections. He also states concepts of wabisabi, 'beauty of imperfection' and mottainai, 'regret experienced from waste' are bound up in the craft and place further value on the repair. Furthermore, kintsugi places as much value on the creative energy which goes into the repair as the creation of the original piece, however, it is Keulemans (2016) opinion that this cultural technique is perceived as so valuable a problem emerges as people deliberately break ceramics in order to repair them to a higher value.

Sennett (2008, p.200) gives another repair dimension, by categorising repairs as either static or dynamic, eliciting different emotional responses. The static simply restores the item to its original function, relieving the anguish of the broken item, whereas the dynamic creatively reimagines the item to a new state, using new tools or changing its function to give a higher value. In this context, Sennett (2008, p.200-201) says that Copernicus, Galileo and Newton, 'could only get somewhere by thinking beyond what they could see'.

This way of thinking beyond can be demonstrated by a new process called bio-kintsugi, developed by Yiwei Cui (Crafts, 2019). Adapted from the original restorative process, it uses a natural self-healing behaviour present in microbes to create calcium carbonate to repair porcelain (Fig.15.). This once again meets the challenge of prolonging the products life, as well as being a challenge for the maker.

Fig.15. *Bio-kintsugi,* Yiwei Cui

Finally, Pye (1995, p.83-84) defines emotionally durable products as those that are designed to wear well but show the passing of time in their use, bringing new aesthetic qualities to be valued. When forgotten or out of fashion, they can be bought back to life again and be valued for the qualities of products of their time.

As recent auction prices have shown, several ceramicists' works are now highly valued due to their work being of an era, of their time. For example, a piece of Hans Coper's 1970's work from his Cycladic series (Fig.15.) sold in March 2018 for a record £381,000 (Berning Sawa, 2018), as collectors are looking to accumulate his works for possible exhibitions in time for his forthcoming centenary in 2020.

Fig.16. Hans Coper's work from the Cycladic Series

The examples above demonstrate different ways of making emotional connections to increase a product's durability within a circular economy. Chapman (2015, p.13) confirms 'there is little point designing physical durability into consumer goods if consumers lack the desire to keep them', suggesting it is this lack of desire to keep products, which is at the core of disposable societies today, generating waste mountains and contributing to climate change.

It is important to consider the role digital technology has played in reinforcing this, with the constant need to upgrade products, but how it may also offer some solutions to the challenges faced by ceramicists. Concerns about technology are raised by Thackera (in Chapman, 2015, p.16), who says cultures have moved 'away from people, towards technology' and Wiedenhoeft (in Adamson, 2018, p.218) goes further to suggest societies will be split between those who are material based and those who are digitally based. Chapman (2015, p.20) says technology has generated a 'marketplace of relentless product obsolescence', where digital products are too complicated to repair, reducing consumer satisfaction and ultimately happiness. Societies must therefore claw this back by re-establishing emotional connections with material things and each other, to enhance well-being in communities.

A way in which technology can support this is how creating emotionally durable designs can be strengthened by creating emotionally durable relationships. Rifkin (2011, p.119) gives Etsy as an example of how an Internet business has disrupted traditional wholesale and retail business models. By directly connecting sellers and buyers online, Etsy has afforded craftspeople the opportunity to create one-to-one relationships with their customers. This personalisation is nurtured through community chat rooms, online craft exhibitions, webinars, social media and a free exchange of ideas. Craftspeople can now successfully compete in a new virtual shopping mall due to the democratisation of manufacturing and marketing.

A further challenge related to rubbish theory is Chapman's view (2015, p.61) that even emotionally durable products can have a limited lifecycle if the original empathy on product purchase declines in meaning over time. Walker (2006, p.169) also states there needs to be an acknowledgment of an object's ephemeral quality. For example, when a product has been purchased as a status symbol, it can be easily discarded to allow it to be replaced with an upgraded model, which Chapman (2015, p.71) says reinforces societies expendable culture. Anthropologist, Gerasirnov (in Chapman, 2015, p66), demonstrates this is not a new phenomenon, as in the Neolithic era, changes of pottery design were attributed to the human need to be different and better than other local communities.

Nevertheless, Chapman (2015, p.178) theorises that 'owning things is an undeniable human need', such as identity symbols and memory references. This need is a barrier to leasing objects, whereby a product can have more than one owner in its lifecycle, thus reducing its impact on natural resources. However, it is exactly this paradigm shift to a more sharing, circular economy of the Third Industrial Revolution which is promoted by Rifkin (2019, p.221). He envisions how businesses will become suppliers not sellers, and consumers become users not buyers, through renting, leasing, sharing. Manufacturers will keep ownership of their products in a glocalised world; ownership will provide incentive to reduce costs by making products locally, as durable as possible, easily serviceable and with a low-carbon footprint, as manufacturers will be responsible for disposing of them at their end of life.

Ceramicists are starting to adapt to this concept and technology can play a significant role in online education. The Internet is already providing information on open access studio spaces to hire (StudioPottery.co.uk, 2019), wheels to rent (Obby, 2019), firing services for hire (Ceramics Studio Coop, 2019), pottery classes to join (Claycraft, 2019), Greenlabs with access to industrial-style machinery (Greenlab, 2019) and online communities such as Freecycle, (Freecycle, 2019). Ceramicists are also offering their products for hire, as demonstrated by Naomi Bikis, whose vessels are available via Modern Art Hire (M.A.H, 2019). These sharing initiatives can be facilitated by ceramicists having ongoing conversations about best practice in relation to climate change. For example, in November 2019, the Dacorum and Chiltern Potters Guild set up a 'Green Team' of members who hope to encourage dialogue through their online Newsletter, reporting on sustainable tips and innovations (McGuirk, 2019).

In this chapter, an evaluation of creating emotional designs to promote durability within a circular economy has evidenced several positive strategies and how technology can support this. Adamson (2018, p227) reflects societies need to value what they already have and rethink basic culture; to stop consuming things unless essential, thereby reducing use of resources for a more sustainable world. Ultimately, this suggests there needs to be fewer products in the closed loop; crafters and consumers need to consider sharing strategies, questioning their making and the value of owning new things.

Conclusion

Although this significant and historic systemic shift to a sharing circular economy is currently mainly voluntary, societies have a choice to pro-actively adapt or risk the accelerating consequences of climate change.

From analysis in Chapter 1, a circular economy is concluded to be needed as a relevant framework to help all businesses, corporations, institutions, governments and countries at micro and macro levels, reduce carbon emissions, design out waste and make products as durable as possible.

Ceramicists face challenges to reduce virgin raw materials and energy, in that efforts to reduce carbon emissions involve many interdependent practical factors. Sourcing local materials, reclaiming clay, once firing at lower temperatures and using a renewable energy supplier, as evaluated in Chapter 2, are some of the positive strategies which individuals can employ. Recent and ongoing innovations, evidenced by case studies, showed how industrial symbiosis using ceramic and other waste materials are also providing some solutions. It is concluded the extent to which significant emissions savings can be made in the future, partly depend on continued investment in technological and scientific research.

If a holistic approach is considered, the durable quality of a ceramic product gives it a long lifetime use, compared to its emissions in production. However, as stated in chapter 2, eliminating carbon emissions altogether is impossible, so carbon offsetting is offered as a possible solution, but comes with costs and controversy. Ceramicists will require their inherent creativity to respond resiliently in rethinking solutions in the move to a carbon-zero world.

Regarding the extent to which ceramicists can employ reusing and recycling as a design strategy to reduce emissions, analysis in Chapter 3 concluded there are opposing views; recycling waste is not necessarily a panacea and upcycling can present a paradox. Creating physical and emotional connections, however, are positive ways in which products can be designed to remain in the closed loop life cycle.

Adamson (2018, p.227) asks: ‘How can we encourage people to value the things in their lives more than they do today?’. Evaluating emotionally durable design in Chapter 4 concluded this to be an effective strategy for a ceramicist to employ, where the aim is to keep products in the closed loop lifecycle for as long as possible. These include creating meaningful artworks, making heirlooms, establishing collectability, using repair methods, and re-introducing products of an era. It is suggested digital and material worlds need to integrate to avoid consumer disconnect, promoting well-being, and ceramicists need to reimagine their place in a sharing economy.

In summary, findings indicate the challenges facing ceramicists to mitigate their carbon emissions within a circular economy are complicated but progressing slowly and positively. Innovations are inspiring a future generation of practitioners to operate more sustainably, while at the same time recognising dependence on technological research to design out waste for mainstream markets.

More must be done through a combination of industry collaborations, scientific experimentation, financial support from governments, sharing information on open source digital platforms, sharing resources and promoting through education. As the Third Industrial Revolution roles out a revised society-wide infrastructure to support the impacts of climate change, the world needs to act collaboratively with a higher consideration for human well-being, appreciating less is more. Ceramicists can further contribute by stimulating conversations and setting examples of responsible practice in this transition.

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