BEYOND DISPOSABLE DESIGN: CHALLENGING PLANNED OBSOLESCENCE THROUGH CIRCULAR ECONOMY PRACTICES

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ABSTRACT

The notion of obsolescence has transitioned from a naturally occurring phenomenon to a planned obsolescence, a strategic business model influenced by consumer demand, market forces, and technological progress. This paradigm began to take shape in the early 20th century and entails the production of pre-designed goods with a limited lifespan. Its widespread implementation has given rise to environmental degradation and increased waste generation. To tackle these challenges, we need to adopt responsible manufacturing practices. Currently, circular economy business models offer a chance to use more conscientious production methods. These methods focus on increasing output efficiency using fewer natural resources and materials. In addition, there is a focus on prioritising material reutilization and recyclability. This paper offers a detailed analysis of the development of planned obsolescence, including its historical evolution, causes, consequences and potential for modification of existing production practices to more fully implement the principles of the circular economy.

Introduction

Obsolescence is an inevitable aspect of an industrial production process. Obsolescence in manufacturing occurs when parts, services, and resources previously available are no longer produced by the original equipment manufacturer, as defined by the International Institute of Obsolescence Management (available at: IIOM), or in other words, the state where materials, chemicals, or equipment used in the production process become outdated or no longer useful.

From the user's perspective, product obsolescence refers to the state where a product becomes outdated, less desirable, or no longer meets their needs, leading to a desire to replace it with a newer model or alternative (Becher, 2021; Fels, 2016). This can be due to various factors, such as technological advancements, changes in fashion, style, or

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trends, wear and tear or deterioration of the product's functionality or appearance over time, incompatibility with newer technologies or services, lack of support, updates, or spare parts from the manufacturer (Fels, 2016).

Although product obsolescence can occur naturally (as technology progresses and consumer preferences evolve), perceived product obsolescence can be influenced by the manufacturer's marketing strategies, as planned obsolescence (Becher, 2021; Fels, 2016). According to J. Bulow's influential paper, "An Economic Theory of Planned Obsolescence" (1986), *obsolescence can be a deliberate strategy manufacturers employ, aiming at products that are designed with predetermined, limited lifespans to ensure consistent demand and consumption patterns (to* encourage repeat purchases*)* (Bulow, 1986).

From the moment this approach was recognised until today, different formulations of the production concept can be found in scientific and professional literature, such as dynamic obsolescence (Grattan, 2016) designed obsolescence, intended, built-in or programmed obsolescence (EP, 2016) or artificially limited lifespan as well early obsolescence (Directive 2024/825).

This obsolescence practice significantly challenges contemporary sustainability principles and the CE. Instead of promoting reuse and recycling, planned obsolescence fosters a culture of constant product replacement, leading to unsustainable consumption, increased waste, and a continuous demand for raw materials and energy. Planned obsolescence put a significant challenge that must be addressed to achieve the sustainability, waste reduction, and long-term resource efficiency advocated by the CE framework (Satiro et al., 2017). In the CE context, planned obsolescence impedes the transition to a more sustainable model and adversely affects consumers. By limiting the repair and extension of product lifespans, promoting continuous resource extraction over reuse and recycling, and imposing financial burdens on consumers, this practice prioritises corporate profit over environmental sustainability and the economic well-being of individuals. It creates a cycle of consumption that contradicts the core principles of the CE (Satiro et al., 2017; Barros, M. & Dimla, E., 2021). Understanding the historical implications of planned obsolescence development is crucial for comprehending potential ways to change industrial practices today.

The evolution of planned obsolescence

The development of the manufacturing concept of "planned obsolescence" dates back to the early 20th century and gained momentum during the Great Depression and also in the post-World War II era. An insight into the mechanisms that have helped to maintain this practice of industrial production to this day, as well as the accompanying consumption strategies, can help to overcome the observed approaches or make them more sustainable.

A significant change in the established approach to production came with new scientific knowledge and numerous technical discoveries in the era of the Second Industrial Revolution. Manufacturers used mass production methods to improve product efficiency. Torstin Veblen observed the social and economic dynamics of the United States of America in the late 19th century, and his work from 1899, The Theory of Leisure Class, was among the first to criticise the behaviour of the wealthy elite during the so-called Gilded Age (1870-1900) (Veblen, 1899). Veblen's concepts of "conspicuous consumption" and "conspicuous leisure" emphasised the ostentatious display of wealth and the non-productive activity of the upper class, emphasising the role of imitation and social comparison in driving consumption patterns (Veblen, 1899). He observes that goods can be made more desirable as their price rises because of the value placed on them as a status symbol, thereby defying the traditional law of demand. From a financial perspective, Veblen believed that the economy should provide for material needs, not vanity; its primary goal is to support life, not to satisfy whims.

For industrial production growth to be more justified by demand for specific goods, assistance in product promotion was becoming increasingly important. It is important to mention the science behind successful advertisements. This is the field in which Earnest Elmo Calkins (prominent American advertiser of 1920s and 1930s) approaches particularly excels. He introduced the concept of "consumer engineering" as a new "business science", which involves planned product development and marketing obsolescence to encourage repeat purchases by combining consumer insights, art, and strategic design (Calkins, 1932). He aimed to create a desire for specific goods by understanding consumer behaviour and preferences. It asks questions like *Would any change in goods or people's habits accelerate their consumption? Can new product models replace existing ones? Can artificial obsolescence be created?* Calkins suggested manufacturing demand through planned obsolescence, intentionally designing products to become obsolete and encouraging repeat purchases: "We have learned that prosperity lies in spending, not in saving. […] The increased profits come from increased production made possible by increased consumption." (Calkins, 1932). The advertising concept promoted by Calkins continues to impact marketing practices today.

During the Great Depression in the USA, the economic downturn was exacerbated by factors like the stock market crash in 1929, financial difficulties in Europe, and adherence to the gold standard. This global financial crisis led to widespread economic challenges, with countries struggling to recover (available at: history.state.gov). To stimulate the economy, Bernard London proposed planning the obsolescence of products to encourage the continuous purchase of new goods, thereby generating income and restoring employment and business prosperity (London, 1932). He coined the term "planned obsolescence" in 1932 with the pamphlet "Ending the Depression through Planned Obsolescence", with the basic idea for the government to impose a legal expiration date on personal items to encourage and sustain purchases, in this way addressing the problem of people not consuming enough during the depression, impacting the manufacturing sector.

The study of the renowned psychologist Abraham Maslow, scientifically confirmed that analysing customer preferences, a practice started by Calkins, can contribute to shaping consumption.

Abraham Maslow proposed a theory of human motivation in 1943 (Maslow, 1943). This theory, commonly applied in human resource management, categorises human needs into five tiers. It starts with fundamental necessities like sustenance, attire, and shelter, followed by security and social standing. The hierarchy culminates in the pinnacle of 'self-actualisation', which emphasises the universal human aspiration to fulfil one's inherent potential. This theory is relevant to planned obsolescence as it helps understand the psychological factors that drive consumer behaviour.

Walter Rostow also deals with the topic of consumption. In 1960, he traced the evolution of society in five stages - from a primarily agricultural society to the use of technologies that led to industrialisation and, finally, the entry into the era of mass consumption (the final stage in the development of society). Rostow based his model on real-life examples of the USA, UK, Germany, Japan and other wealthy nations, which followed more or less the same path (Reid-Henry, 2012). According to Rostow, the era of mass consumption represents the ultimate destination for any advanced economy, underscoring consumption's profound impact on societal advancement.

While Maslow's hierarchy links the self-actualisation of human needs with materialistic aspirations, Rostow's theory identifies mass consumption as the final stage of economic development (implying that increased consumption drives social progress). Both models suggest that excessive consumption is the driver of progress, prioritising it. However, these models do not consider the long-term unsustainable consequences of this approach, such as environmental degradation, overexploitation of resources, and strengthening of the culture of materialism, which is becoming more and more noticeable nowadays.

Rapid industrial development and increasing mass consumption raised concerns among the scientific community about the irrational use of resources. The report "Limits to Growth" (1972) predicted that without intervention, Earth's resources would be depleted due to the existing economic model (Meadows, 1972). The computer model in the report underscores mass production and consumption concerns, often resulting in resource depletion and environmental degradation.

Modern implications of planned obsolescence

Today, it is evident that maintaining the mass industrial production model requires implementing various mechanisms to support this approach. Market policies have led to different methods of guiding consumers towards purchasing new products.

Types of obsolescence are usually identified as:

1. Planned obsolescence: Bulow, in his seminal work, discussed that planned obsolescence can be a deliberate manufacturing strategy and stated that it is "much

more than a matter of durability; it is also and perhaps primarily about how often a firm will introduce a new product, and how compatible the new product will be with older versions" (Bulow, 1986). Maybe the most simplified understanding of the term involves designing a product to have a shorter lifespan or to function for only a limited number of operations (EP, 2016).

2. Indirect obsolescence: This occurs when the component required for repair is unobtainable or when it is not practical or cost-effective to repair the product.

3. Incompatibility or system obsolescence occurs when products fail to operate efficiently following successive software updates, prompting consumers to replace the product rather than attempt a potentially more expensive repair. An example is software updates that might slow or make a device stop functioning. Obsolescence related to software is an increasing worry as digitisation increases. Another example is electronic devices, where only specific components, such as batteries, become obsolete, but the repair cost exceeds the cost of replacing the entire commodity. Therefore, consumers are often indirectly forced to buy a new product rather than repairing the broken one.

4. Style, aesthetic, or psychological obsolescence: This is related to marketing campaigns encouraging the replacement of perfectly functional products due to changing styles. Marketing campaigns drive this obsolescence, which is usually studied in the fashion domain and consumer goods. A product still in perfect shape goes 'out of style' when a newer version or model that includes new features is released.

5. Technological or functional obsolescence occurs when a product becomes out of date because consumers are more interested in products with improved performance due to improved technology. In his book, The Waste Makers (1960), Packard addmits that "we are all heartily in favour of the functional type of obsolescence that is created by introducing a genuinely improved product (Packard, 1960)."

The easiest way to categorise planned obsolescence approaches is through three categories: function, quality, and desirability.

Planned obsolescence can impact the economy in multiple ways. This approach can provide short-term economic benefits for manufacturers and retailers by driving increased sales and revenue by constantly replacing products. It helps maintain stable or growing sales, as consumers are compelled to repeat purchases more frequently. But a society built on excessive consumption and disposal of goods is unsustainable in the long run, leading to resource depletion, environmental degradation, and a culture of waste, so this approach can have negative long-term consequences for the overall economy, as it undermines the principles of a CE and sustainable development.

Systematic directing of consumers towards purchasing new goods places a financial strain on consumers, who are forced to replace products, even if they are still functional constantly. This can lead to a reduction in consumer spending power and overall economic stability. With further technological development, additional consequences of mass production

with built-in obsolescence is the increased generation of particular types of waste, for example, electronic waste, which has significant environmental and economic costs, such as pollution, resource depletion, and the need for waste management infrastructure. These environmental costs can ultimately impact the broader economy and society.

Discussions

Mass production and consumption generate large amounts of waste. In this era of accelerated social, economic, and technological development, this waste is viewed as a challenge that needs consideration and new, more rational solutions.

The "3R Initiative", focusing on *reduce*, *reuse*, and *recycle* (Initiative, 2005) plays a crucial role in addressing resource depletion and mass consumption, not merely a proposal but a resounding global call to action. Its inception at the 2004 G8 Summit and subsequent official launch at the Ministerial Conference in 2005 marked a pivotal moment (Barrie, 2022) [19]. This international recognition addresses the urgent issues of waste management and environmental sustainability.

The linear economic model supports resource consumption and contributes to waste generation primarily for profit. In response to this established industrial approach and to address the environmental and economic limitations of the "take-make-waste" method, there is a push to promote more sustainable production and consumption patterns through the CE approaches (EMF, 2013). Encouraging the constant replacement of products, generating an unsustainable consumption cycle, leading to the premature disposal of still functional products and wasting natural and energy resources used in their production, planned obsolescence, directly conflicts with the principles of the CE (hereafter "CE") which aims to minimise waste and promote sustainability through reuse, recycling, and reduction of consumption. To date, ten separate R's (R0-R9) have been stratified as different CE strategies, forming "9R-Framework" or R circularity strategies (Potting, 2017). By adopting tactics like *refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle*, and *recover*, businesses can prolong the lifespan of products, reduce waste output, and encourage a transition towards greener production practices (Alivojvodic, 2024). R-strategies' hierarchy ranges from R0 to R9, with higher priority indicated by lower R numbers (Alivojvodic, 2024).

Potentials for the shift of industrial systems towards circular economy practices

The 9R framework offers a valuable approach to combat planned obsolescence in industrial manufacturing by promoting sustainable methods prioritising resource efficiency, product longevity, and waste reduction. These methods underscore the importance of creating durable, easily repairable products suitable for reuse, effectively mitigating the adverse effects of planned obsolescence and fostering a circular, sustainable ethos within industrial operations. The critical changes industrial systems need to make to transition from a linear economy based on planned obsolescence to a circular economy include.

By addressing these key areas, such as product durability, extended producer responsibility, service-centred business models, and enhancing the reuse and refurbishment market, industrial systems can transition from planned obsolescence to a circular economy (hereafter: CE). This shift leads to more sustainable production and consumption patterns, reducing waste and promoting overall sustainability.

Contemporary industrial systems need to transition from a linear economy approach with usually embedded planned obsolescence to a CE. Modification of existing systems requires a comprehensive approach. Some of the critical steps to shift towards a CE:

1. Redesigning products for longevity and reusability through durability - design products to last longer, reducing the need for frequent replacements; modularity - utilise modular designs for easy repair and upgrades, or standardisation - incorporate standardised parts to facilitate repair and recycling (Bakker, 2015).
2. Establishing circular business models, some of them are:

- Product-as-a-Service (PaaS) - transition from product sales to service offerings, maintaining ownership and responsibility for the product lifecycle.
- Leasing and sharing models - promote models where consumers lease or share products instead of owning them outright (Lacy, 2015).

3. Improving the reuse and refurbishment market by enhancing connectivity between consumers and automating processes like disassembly, sorting, and refurbishment to facilitate the continuous circulation of products and materials.
4. Legislation and policy support – through regulations on planned obsolescence (implementation of policies that discourage planned obsolescence and promote product longevity) and incentives for circular practices (offering tax breaks, grants, or subsidies for companies that adopt CE practices) (European Commission, 2020).
5. Promoting consumer awareness and participation - through education campaigns or incentives for participation, it is possible to raise awareness about the benefits of a CE and the importance of product longevity and/or provide incentives for consumers to return products or participate in recycling programs.
6. Developing reverse logistics systems (Barrie, 2022):

- Collection systems: Establish systems for collecting used products from consumers.
- Sorting and processing: Create facilities for sorting, cleaning, and refurbishing products.
- Take-back programs: Implement programs where consumers can return old products.

7. Implementing recycling and resource recovery (Lacy, 2020):

- Material recovery: Invest in technologies to recover materials from end-of-life products.
- Closed-loop recycling: Promote processes that allow materials to be recycled into the same product.

8. Collaboration across the supply chain through cross-sector collaboration (work with suppliers, manufacturers, and recyclers to create a closed-loop system), and applying transparency and traceability (developing systems to track the lifecycle of products and materials) (Barrie, 2022).

Agri-Food industry. It is essential to mention that a planned obsolescence strategy designed to shorten product lifespans has significant implications for the agricultural sector and food production industries. In these sectors, planned obsolescence manifests through practices such as developing non-reproductive seeds, rapid turnover of agricultural equipment, and promoting disposable packaging in food products. These practices contribute to increased waste generation, environmental degradation and resource depletion (available at: www.rubbermaid.eu). Moreover, the linear "take-make-waste" model in the food industry leads to substantial food waste throughout the supply chain, from farm to plate. According to the Ellen MacArthur Foundation, *for every dollar spent on food, society pays two dollars in health, environmental, and economic costs* (EMF, 2019). This unsustainable approach impacts the environment and challenges food security and financial stability in the long term.

The circular economy approach offers change by implementing modular designs for agricultural equipment, developing durable bio-based materials, and creating closed-loop systems for nutrient recycling, extending product lifespans and minimising waste. It also encourages valorising food waste and by-products, creating new value streams and reducing environmental impact (Alzaabi et al., 2024).

The European Union's fight against planned obsolescence

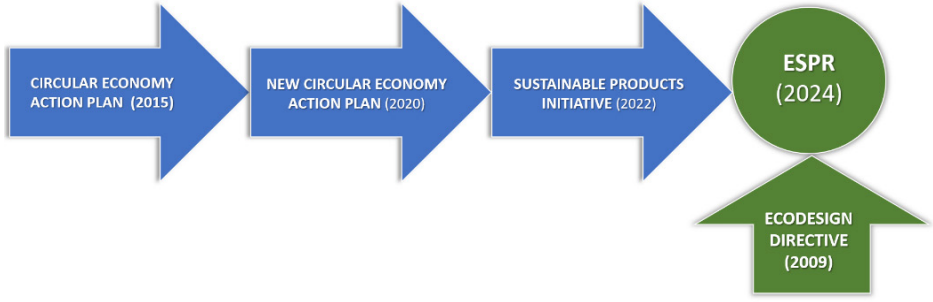
To combat planned obsolescence, adopting a more responsible production and consumption pattern is crucial, reducing waste generation and promoting the reuse and recycling of products. Implementing the changes within the existing situation requires a complex systematisation and analysis of various forms and characteristics of planned obsolescence, as well as legislation that would support these developments, which are necessary.

The European Union has recognised the urgent need to address planned obsolescence systematically by applying CE principles and integrating them within legislative regulations. Significant steps have been taken to solve complex challenges, including adopting the Circular Economy Action Plan (2015) that sets a target to achieve a carbon-neutral, environmentally sustainable, toxic-free, and fully CE by 2050 through introducing measures to improve resource efficiency and waste management. The document stated that "planned obsolescence practices can limit the useful lifetime of products". Further development led to the New Action Plan for the Circular Economy (2020), which aims to enhance the entire life cycle of products by promoting sustainable practices and preventing waste generation in the EU economy (EC, 2020). The Action Plan consider establishing sustainability principles for restricting single-use and countering premature obsolescence, empowering consumers and providing cost-saving opportunities, strengthening consumer protection against greenwashing and

premature obsolescence, setting minimum requirements for sustainability labels/logos and information tools, as well as implementing the 'right to repair' in electronics and ICT, including a right to update obsolete software (EC, 2020).

In 2017, the European Parliament adopted a non-binding resolution entitled "A Longer Lifetime for products: benefits for consumers and companies" (EP, 2017). This resolution advocated that prolonging the lifetime of goods would benefit consumers and companies. Parts of proposed EU actions are the development of a unified definition of planned obsolescence for goods and software in consultation with stakeholders, exploring the potential for establishing an independent system to detect built-in obsolescence in products in cooperation with market surveillance authorities, providing better legal protection for whistleblowers and producer deterrents. The document also highlighted initiatives by Benelux countries to combat planned obsolescence and extend household appliance lifespan. It recognised that upgradeable products can slow obsolescence and reduce environmental impact and user costs (EP, 2017). In 2022, the European Commission published its Sustainable Products Initiative (SPI) (European Commission, 2022), which focuses on sustainability requirements, supports durable, reusable, and repairable products and helps prevent greenwashing and premature obsolescence. The Initiative aims to accelerate the revision of Ecodesign Directive 2009/125/EC towards the new Directive - Regulation on Ecodesign on sustainable products (ESPR), with the expected entry into force in the middle of 2024 (Figure 1).

Figure 1. Policy framework around The Ecodesign for Sustainable Products Regulation (ESPR)



Source: Author's

Meanwhile, no specific actions or new measures were proposed towards solving challenges connected with observed planned obsolescence practices, even though the latest, European Union Directive (2024/825) on empowering consumers for the green transition, Empowering Consumers Directive or ECD, entered into force in 2024 (EU Directive 2024/825, 2024). The Directive aims to protect consumers from being misled by communications relating to the environmental, social, or circular aspects of a product and services, including practices associated with the early obsolescence of goods (EU Directive 2024/825, 2024). The law does not prohibit early obsolescence, the intentional limitation of a product's life for immediate repurchase, nor does it restrict practices

that impede repair; it does not impose obligations to improve product longevity and repairability, and it prohibits advertising of defective products, but only if marketers are aware of the defects. The new Directive, ESPR and the ECD would systematically and simultaneously promote sustainability and protect consumers in the EU, with the ESPR insisting on setting minimum standards for products to improve durability, reusability, recyclability, upgradability, and reparability, reducing environmental impacts and enhancing market functioning (EP, 2022).

The common understanding is of crucial value through standardisation for all activities towards incorporating changes within production-consumption relations. Monitoring frameworks should standardise terminology, define quantifiable baselines, and improve data quality to capture circularity effectively (Alivojvodic, 2023).

Conclusions

The concept of product obsolescence has evolved from a natural phenomenon to planned obsolescence, a more strategic business model driven by consumer and market dynamics and technological developments.

Historical insight into the development of planned obsolescence is not just informative but crucial for identifying opportunities to reform industrial practices, promote sustainable consumption, and mitigate the environmental impact of single-use culture. By learning from the past, industries and consumers can work together to create a more sustainable and CE that prioritises longevity, resource conservation, and responsible consumption practices.

A focus on eliminating the concept of planned obsolescence can divert resources and attention from developing more durable, repairable, and sustainable products, hindering the long-term innovation and competitiveness promoted by the concept of a CE.

The transition to a circular production approach takes work for the industry sector. Planned obsolescence is only one aspect of industrial approaches, but changing this industrial production practice is challenging and could bring useful changes. For example, the agri-food industry can transform from a linear model to a circular approach by implementing modular designs for agricultural equipment, developing sustainable bio-based materials, and establishing closed nutrient recycling systems. These changes will lead to extended product life, reduced waste, and the creation of new value streams.

The European Union's example shows that changes require time and effort to obtain legislation that can modify existing practices. The EU's proactive approach in the fight against planned obsolescence incorporates initiatives, legislative actions, and strategies to promote the CE. The goal is to extend the life cycle of products, empower consumers, and improve environmental sustainability within the EU.

In summary, while planned obsolescence may provide short-term economic benefits, it may have harmful long-term consequences for the economy, including environmental degradation, resource depletion, and reduced consumer welfare and financial stability.

However, it is important to emphasise consumers' role and the power to reshape production patterns.

Conflict of interests

The authors declare no conflict of interest.

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