

# Planned Obsolescence: Bibliometric Analysis from 1967 to 2024

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Through a systematic analysis of academic literature across various disciplines, the research identifies key findings on the impact of planned obsolescence on consumer spending, waste generation, and supply chain management. The evaluation examines the economic, environmental, and social repercussions of planned obsolescence, taking into consideration its effects on consumer behaviour, industry techniques, and sustainability efforts. By systematically analysing academic papers across various disciplines, the study identifies crucial findings regarding the impact of planned obsolescence on consumer spending, waste generation, and supply chain management. The results indicate that although planned obsolescence has the potential to boost economic advancement and creativity, it also plays a part in environmental deterioration and the exhaustion of resources. The study suggests the adoption of more sustainable manufacturing approaches and increased consumer consciousness to mitigate these adverse effects. Moreover, the research highlights the need for further investigation into the societal implications of planned obsolescence and its wider impact on the community.

**Keywords:** Planned Obsolescence, Consumer Behaviour, Sustainability, Social Media Engagement, Systematic Approach

## 1. Introduction

Planned obsolescence refers to the intentional design and production of products with a limited lifespan, encouraging consumers to replace them more frequently. This strategy is employed by companies to ensure continuous sales and revenue [Zallio, M; Berry, D (2017)] [Philip R.S.; Anian A.M.; Et al (2020)]. The practical implications of planned obsolescence are twofold. Firstly, it leads to increased consumer spending as individuals are compelled to purchase new products more frequently, resulting in a boost in sales for companies [Carbonell-Nicolau O. (2023)]. Secondly, planned obsolescence contributes to environmental concerns, as the disposal of discarded products adds to waste and pollution [Lee S.-H.; Niem L.D. (2010)]. Additionally, it can create challenges for supply chains and forecasting in industries like fashion, where rapidly changing trends and customer requirements make it difficult to predict demand and plan production accordingly [Subramanya T.R.; Saroj N. (2023)]. Overall, planned obsolescence has both economic and environmental implications, impacting consumer behaviour, industry practices, and sustainability efforts.

Planned obsolescence does indeed affect different parties in specific ways. It can be positive for

producers as it allows them to expand their market and create more products, leading to increased revenue and profits. However, it has negative consequences for the environment and consumers. The intentional defects in product design and the limited lifespan of products contribute to the generation of e-waste, which harms the environment and wastes natural resources [Zongwe D.P.; Mahantesh G.S.; Et al (2023)]. Manufacturing electronic gadgets also leads to massive pollution [Martins M.O.; Barone D.(2017)]. Recent discoveries have highlighted the use of performance-reducing software and structurally weak goods as strategies in planned obsolescence, with multinational tech giants like Apple and Samsung utilizing these techniques [Junge I.; van der Velden M. (2018)]. Additionally, there is a growing critical discourse on planned obsolescence in the context of information and communication technologies, with discussions on its root causes and societal perspectives [Carbonell-Nicolau O. (2023)].

The need to completely stop planned obsolescence is debatable. Some argue that it should be practiced because it encourages consumers to replace products, stimulating economic growth and innovation [Zallio, M; Berry, D (2017)]. Additionally, planned obsolescence can be seen as a strategy to persuade consumers that style is an important element in product desirability [Maitre-Ekern E.; Dalhammar C. (2016)]. However, there are reasons to oppose planned obsolescence. It can lead to excessive consumption and waste, which is unsustainable for the environment and the economy [Philip R.S.; Anian A.M.; Et al (2020)]. Movements like "Degrowth" argue that current consumption levels are already unsustainable [Carbonell-Nicolau O. (2023)]. Furthermore, some countries have criminalized planned obsolescence, recognizing it as an infraction that can be punished with prison time and fines [Lee S.-H.; Niem L.D. (2010)]. These measures indicate a growing awareness of the negative impacts of planned obsolescence. Ultimately, the decision to completely stop or continue practicing planned obsolescence depends on weighing the economic benefits against the environmental and social costs. This can be understood well by conducting a systematic literature review on the topic of Planned obsolescence.

## 2. Research Methodology

The approach employed in this research on planned obsolescence entailed a systematic bibliographic review methodology conducted through data collection and analysis. Initiated on February 2, 2024, the data gathering procedure concentrated on identifying relevant scholarly articles utilizing the academic databases Web of Science and Scopus. Web of Science and Scopus are renowned academic repositories. Web of Science encompasses a broad array of scientific journals and provides citation analysis tools. In contrast, Scopus encompasses content in science, technology, medicine, social sciences, and arts and humanities. Moreover, it offers features for citation examination and author profiles. Both repositories hold significance for scholars seeking to access and assess academic writings. These platforms were selected due to their extensive coverage of scholarly works.



Fig.1: Process of Finding Research Papers

The steps as shown in Fig. 1, we started by employing the search term "planned obsolescence," articles were chosen based on their incorporation of the term in the Topic, Title, or Keywords sections. Initially, total 633 articles were recognized, with 378 available for retrieval after eliminating the inaccessible papers. A detailed evaluation of these articles resulted in the exclusion of 78 papers that were not directly relevant to the research topic, culminating in a final compilation of 300 articles for the literature review. The inspection of these 300 articles was completed by March 17, 2024, marking the end of the data collection and analysis phase. This systematic approach facilitated a comprehensive and relevant selection of literature for the study.

The outcomes of the Analysis, along with their implications, are subsequently showcased in a simplified tabular and graphical format in the subsequent sections below. The remaining document is classified into the following sections: Section 3. Result and findings, section 4. Discussion and conclusion, and section 5. Implications and limitations of the study

### 3. Results and Findings

#### A. Demographic Characteristics

##### a. Year-wise papers published on planned obsolescence during 1967-2024

Fig. 2 illustrates the distribution of scholarly articles on planned obsolescence across various time intervals. A steady increase in the volume of publications is observable over the years, particularly noticeable from 2010-2014 onwards, where one of the articles during that time range highlighted that waste production represents a substantial industry, with numerous stakeholders [Bartl A. (2014)] showing reluctance towards waste reduction. The implementation of more intricate incentives is deemed necessary to sever the link between economic expansion and waste generation. This pattern implies a mounting attention and emphasis on the subject in recent times, potentially mirroring its escalating importance in academic discussions and practical implementations. The significant surge in published works from 2015-2019 to 2020-2024 signifies a notably heightened interest or a deeper investigation of planned obsolescence during this specific timeframe. During the time frame of 2020-2024, a study suggested that environmentally sustainable electronics can be defined as electronic devices [Cenci M.P.; Scarazzato T.; et al. (2022)] that, either directly or indirectly, result in a net positive impact on the environment compared to their counterparts.

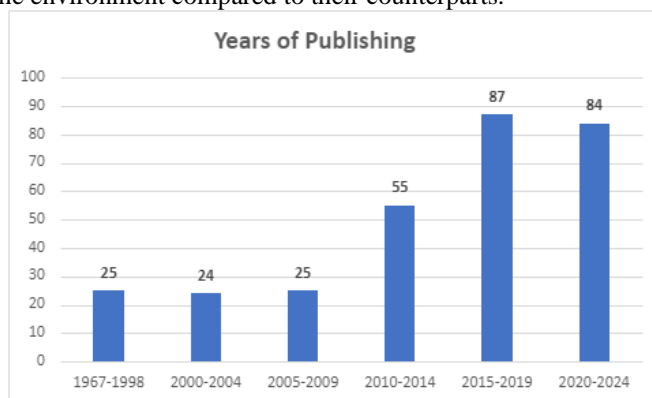


Fig.2: Process of Finding Research Papers

##### b. Country/Region wise publication on planned obsolescence

Fig. 3 illustrates the quantity of published papers on planned obsolescence per country, offering an insight into the global dispersion of research on this subject. Nations such as Mauritius, Oman, Saudi Arabia, South Africa, Mexico, UAE, Finland, and Turkey have individually produced 1-5 papers, indicating a comparatively lower level of research productivity. On the other hand, a moderate level of research engagement can be observed in Austria, Denmark, Japan, Taiwan, China, the Netherlands, Australia, South Korea, France, Spain, Sweden, and Germany, each producing 6-10 papers.

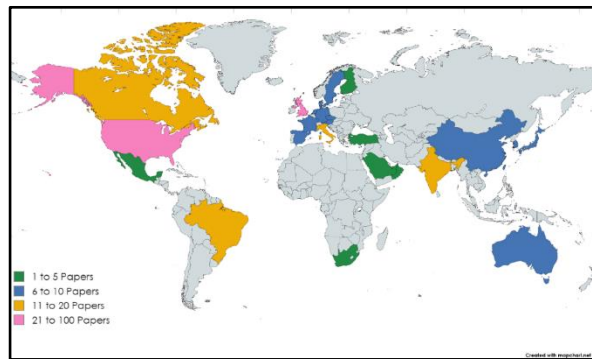


Fig.3: Region wise paper distribution

Illustration generated using mapchart.net

Whereas, India, Italy, Brazil, and Canada have each released 11-20 papers, suggesting a heightened degree of research enthusiasm. The United Kingdom and the United States of America have taken the lead by presenting 21-100 papers each, signifying a substantial emphasis on research related to planned obsolescence in these countries. This distribution underscores the varying extents of attention and significance allocated to planned obsolescence across diverse global regions.

c. Highest contributing countries per region

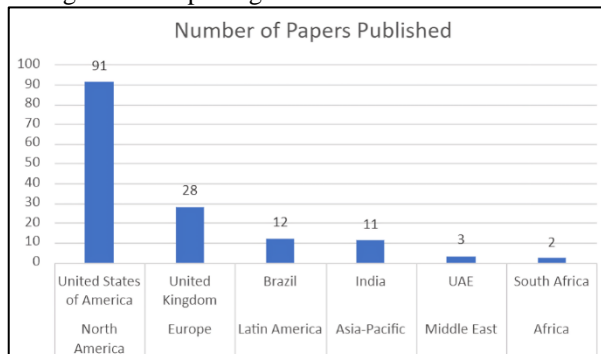


Fig.4: Country wise contribution towards research

Discussing from the data shown in Fig. 4, the country with the highest contribution from each region based on the number of papers published on planned obsolescence, North America is represented by the United States of America, with 91 papers, indicating a substantial emphasis on the topic within the region. Notably, a study by [Gostin, LO; Sapsin, JW; (2002)] suggested the necessity for updates in State laws to proficiently handle public health crises. Within Europe, the United Kingdom leads with 28 papers, highlighting a significant research interest. [Cooper T. (2004)] argued in one paper that Consumers play a crucial role in combatting the rise in appliance waste but encounter economic disincentives and a lack of comprehensive product details. In Latin America, Brazil emerges as the primary contributor with 12 papers, including a study stating that Brazilian consumers accept and adapt [Echegaray F. (2016)] to planned obsolescence practices. India takes the forefront in the Asia-Pacific region with 11 papers, including a publication exploring jugaad as a form of innovative repurposing in India, involving the repair, reuse, and transformation of diverse items [Badami N. (2018)] within the informal sector. Leading the Middle East is the UAE with 3 papers, with a research piece advocating for the use of circular materials in sustainable manufacturing and recycling [Dumée L.F. (2022)], promoting a holistic approach to product life cycles. South Africa leads in Africa with 2 papers, including a study reporting that the consumers tend to switch to brands with more ethical practices upon realizing the use of planned obsolescence. However, consumer loyalty to these brands

persists due to the satisfaction derived from their products and services [Amolo J.; Beharry-Ramraj A. (2016)], coupled with the anticipation of improved quality. This signifies the varying degrees of scholarly involvement in investigating planned obsolescence in various geographical regions, with North America and Europe standing out as the prominent contributors.

d. Top 10 Highly Cited Countries

Table 1: Top 10 Highly Cited Countries

Top 10 Highly cited Counties	Total Citation count
USA	1309
UNITED KINGDOM	916
GERMANY	211
CANADA	194
BRAZIL	150
SWEDEN	139
ITALY	105
AUSTRALIA	98
FRANCE	89
NORWAY	85

The tabular representation in Table 1 furnishes a compilation of the top ten countries with significant citation counts in the domain of planned obsolescence research. The foremost position is held by the United States, recording 1309 citations, wherein a study by [Patterson, ML, 1998] posited that Exponential revenue growth materializes when the generation of novel value for consumers outpaces the rate at which outdated goods and services become obsolete. Following suit is the United Kingdom with 916 citations, featuring a publication by [Forge S., 2007] which asserts that Sustainability in the ICT sector is not solely the duty of the government, but also of all ICT users and producers. Broadly speaking, the onus lies on all parties involved in the production, utilization, and disposal of ICT to comprehend and execute 'green ICT'. Noteworthy contributions are also made by Germany, Canada, Brazil, Sweden, Italy, Australia, France, and Norway in the examination of planned obsolescence, each with distinct citation levels. This observation signifies a widespread interest and engagement on a global scale in investigating the concept of planned obsolescence and its implications across various nations.

e. Top 10 Publishers

Fig. 5 presents the leading 10 publishers as per the quantity of academic articles they have released on the topic of planned obsolescence. Among them, Elsevier stands out as the leader, having released 60 articles, including one which showcased the ease of adopting the DSS [Pallottino, S; Sechi, GM; Et al. (2005)] for practitioners and end-users. Following closely is Springer with 43 articles, one of which, delved into the role of consumers [Cooper T. (2004)] in waste accumulation.

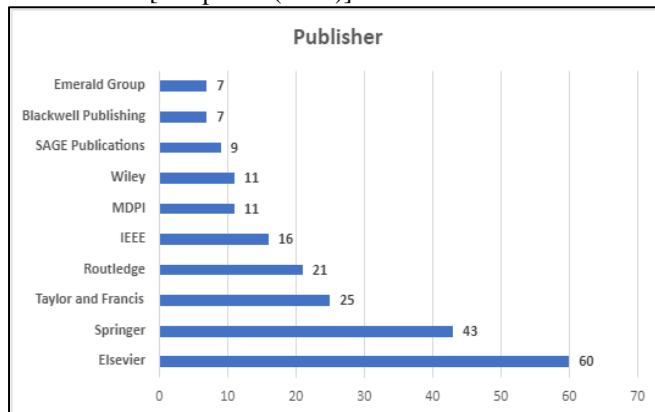


Fig.5: Top 10 Publishers

Taylor and Francis secured the third position with 25 articles, one of which, emphasized the significance of community involvement and relevant indicators [Vehbi, BO; Hoskara, SÖ (2009)] in

successful revitalization projects. This ranking indicates the prominent role these publishers play in disseminating research on planned obsolescence. The substantial volume of their publications implies a preference among researchers for these publishers when circulating their discoveries in this domain.

f. Top 5 Institutions

Table 2: Top 5 Institutions

Institution	No. of Papers Published
University of Maryland	7
University of Alaska	6
University of California	5
Aalborg University	4
University of Toronto	4

The top five universities are ranked in Table 2 according to the quantity of research publications they have published on planned obsolescence. The College of Maryland stands out with 7 articles, with one of its notable publications delving into the reasons why legacy systems [Sandborn, PA; Prabhakar, VJ (2015)] are frequently retained rather than replaced. Following closely is the College of Alaska in second place with 6 publications, including one which asserts that planned obsolescence in sales markets [Goering G.E. (2007)] results in economically unsustainable product lifespans. In third place is the College of California with 7 publications, among them a work that offers a critical analysis of capitalism's approach to waste management [Miller E.C. (2011)] and advocates for more sustainable production methods. Aalborg University and the College of Toronto tied for fourth place with 4 articles each. This ranking indicates how active and involved these institutions are academically in the topic, implying that they might be playing a significant part in shaping the discussion on planned obsolescence.

g. Top 5 Authors

Table 3: Top 5 Authors

Author	No. of Papers Published
Goering G.E.	6
Sandborn, P	5
Dalhammar C.	3
Haase L.M.	3
Laursen L.N.	3

The Table 3 depicts the highest-ranked authors based on the quantity of research articles they have published on planned obsolescence. Leading the group of researchers with a total of 6 publications is Goering G.E., with one notable work which posits that a firm's decision on product longevity [Goering G.E. (2007)] might be impacted by the associated complementary product. Following closely is Sandborn, P., who has authored 5 papers, including one which discovered that due to the exorbitant cost of replacement [Sandborn, PA; Prabhakar, VJ (2015)] outdated systems are frequently retained until their advanced age leads to severe malfunctions or support expenses that are unsustainable, and tying with 3 papers each are Dalhammar C., Haase L.M., and Laursen L.N. The result demonstrates the frequency with which these authors have made contributions to the body of knowledge on planned obsolescence, exhibiting their proficiency and potential to influence discussions and future prospects for this field of study.

h. Top 5 Highly Cited Articles

Table 4: Top 5 Cited Articles

Top 5 Highly cited articles	Times Cited	Authors
A longitudinal investigation of personal computers in homes: Adoption determinants and emerging challenges	949	Venkatesh V.; Brown S.A., 2001.
An economic theory of planned obsolescence	330	Bulow J., 1986
Inadequate Life? Evidence of Consumer Attitudes to Product Obsolescence	218	Cooper T., 2004
Has the question of e-waste opened a Pandora's box? An overview of unpredictable issues and challenges	148	Bakhiyi B.; Gravel S.; Et al, 2018
A new perspective on planned obsolescence	145	Waldman M., 1993

The extensively cited articles concerning planned obsolescence ranked in Table 4 offer valuable *Nanotechnology Perceptions* Vol. 20 No.5 (2024)

insights into this phenomenon. A study titled "A longitudinal investigation of personal computers in homes," which has been cited 949 times, demonstrates that individuals who adopt new technologies are motivated by utilitarian, hedonic, and social gains [Venkatesh V.; Brown S.A., 2001], while those who do not adopt fear rapid technological obsolescence. [Bulow J., 1986], "An economic theory of planned obsolescence," cited 330 times, underscores that planned obsolescence encompasses not only product durability but also the frequency of product introductions and compatibility with previous versions. In a study cited 218 times, [Cooper T., 2004] explores consumer perceptions of product obsolescence in "Inadequate Life? Evidence of Consumer Attitudes to Product Obsolescence," suggesting that consumers can reduce appliance waste through improved information and incentives. These collective research efforts illuminate the factors driving planned obsolescence, its economic ramifications, and consumer sentiments, providing valuable insights for both industry stakeholders and policymakers.

B. Methodological Trends

a. Approach used in the research

Table 5 representation delineates the diverse methodologies employed in scholarly articles on planned obsolescence for the purpose of drawing inferences. The most common approach is the Secondary Data Analysis Approach, found in 66 publications where a study within this category suggested that the Continued use of planned neck dissection post-chemoradiation lacks justification [Ferlito A.; Corry J.; et al. (2010)], as Posttreatment CT can assist in selecting patients for observation, rendering the former method outdated in the healthcare sector.

Table 5: Approach Used in research

Approach	No. of Papers Published
Secondary Data Analysis Approach	66
Mathematical Model Approach	65
Survey/Interview & Empirical Approach	50
Case Study Approach	43
Review & Planning Approach	36
Statistics & Data Analytical Approach	24
Testing & Simulation Approach	14
Theoretical Model Approach	10

Following closely is the Mathematical Model Approach, employed in 65 articles, one of which [Waldman M. (1996)] explored the correlation between R&D decisions and profitability. The Survey/Interview & Empirical Approach is evident in 50 papers and one of these papers highlighted the role of Consumers in extending the product lifecycle [Hennies L.; Stamminger R. (2016)], emphasizing the importance of primary data collection techniques. The Case Study Approach is utilized in 43 publications, emphasizing the significance of real-life examples in understanding planned obsolescence where one of them investigated reuse, hardware hacking, and circuit bending [Hertz G.; Parikka J. (2012)] in media history. Additionally, the Review & Planning Approach is found in 36 papers, focusing on consolidating existing knowledge and outlining future directions where one explored the methods to enhance operational availability [Fonseca A.M.; Fernandes F.H.; et al. (2017)] through meticulous planning and system migration. Furthermore, the Statistics & Data Analytical Approach, Testing & Simulation Approach, and Theoretical Model Approach are discernible in 24, 14, and 10 papers respectively, showcasing a varied array of methodological strategies employed in investigating planned obsolescence.

b. Research Areas selected

Table 6: Research Area Covered

Research Area	No. of Papers Published
Environmental Sciences & Ecology	60
Business & Economics	54
Science & Technology	46
Engineering	22

Research Area	No. of Papers Published
Operations Research & Management Science	18
Government & Law	14
Sociology	13
Construction & Building Technology	12
Urban Studies	12
Education & Educational Research	10
Health Care Sciences & Services	7
Clothing	6
Information Science & Library Science	4
Marketing	4
Oceanography	4
Arts & Humanities	3
Energy & Fuels	2
Public Administration	2
Transportation	2
Agriculture	1
Gaming	1
Media	1
Research	1
Tourism	1

Table 6 illustrates the distribution of scholarly articles on planned obsolescence in various academic disciplines, highlighting the cross-disciplinary characteristic of the subject matter. Research Areas namely Environmental Sciences & Ecology, Business & Economics, and Science & Technology emerge as the priority of research interest, with 60, 54, and 46 publications respectively, signifying the wide-ranging attention given to planned obsolescence from environmental, economic, and technological perspective. A study within Environmental Sciences & Ecology [Bakhiyi B.; Gravel S.; Et al (2018)] delved into e-waste issues, while a paper from Business & Economics by [Bulow J. (1986)] discusses how planned obsolescence extends beyond product durability to encompass the frequency of new product introductions and their compatibility with older versions. Additionally, a study from Science & Technology claimed that technological obsolescence, driven by rapid technological advancements [Watanabe C.; Naveed N.; Et al. (2019)], primarily leads to functional obsolescence. Furthermore, Engineering, Operations Research & Management Science, and Government & Law represent a substantial volume of publications, indicating that planned obsolescence is examined within the field of engineering principles, managerial approaches, and legal frameworks. The extensive list of academic fields represented underscores the multidimensional aspect of planned obsolescence and its relevance across diverse domains of study.

c. Subject covered in the research

Table 7: Subject of Research studied

Subject	No. of Papers Published
Consumer Products	88
Waste	23
Civil Development	21
Technology & Equipements	21
Electronic Components	18
Product Design	18
Sustainability Ideas	17
Business & Operational Planning	14
Educational Infrastructure, Course & Curriculum	13
ICT	13
R&D / Production Facility Management	9
Digital Services	7
Medicine & Healthcare	7



Subject	No. of Papers Published
Society, People & Heritage	7
Business Ethics & Law	6
Transportation	4
Energy & Mineral Resources	3
Fashion & Lifestyle	3
Shopping Outlets	3
Human Behaviour	2
Agriculture	1

The classification presented in the Table 7 represents the subject matter explored in academic papers concerning planned obsolescence, illustrating the diverse range of topics encompassed under this overarching theme. Primarily, Consumer Products emerge as the central focus, with 88 articles examining various aspects of planned obsolescence within this domain where a study highlighted that the economic utility of a product is not solely dependent on its physical longevity [CHOI, JP (1994)]; a product may lose its economic value even if it is fully functional, due to the presence of a superior alternative at a lower cost or due to compatibility issues between different product generations. Waste management and Civil Development also play a significant role, with 23 and 21 articles respectively, shedding light on the environmental and societal impacts of planned obsolescence. A publication on Waste management by emphasized the need to enhance awareness on electronic waste issues [Bakhiyi B.; Gravel S.; Et al (2018)] for comprehensive solutions, and a study on Civil Development discussed the importance of perceiving the city [Buitelaar, E; Moroni, S; De Franco, A (2021)] as a complex, dynamic system that requires proactive, adaptive policies. Similarly, Technology & Equipements and Electronic Components are studied, each with 21 and 18 papers, signifying the technological aspects related to planned obsolescence. Furthermore, other areas such as Product Design, Sustainability Ideas, and Business & Operational Planning attract considerable attention, showcasing the multifaceted nature of planned obsolescence across diverse sectors and disciplines.

d. Perspective of study towards

The classification of research articles on planned obsolescence in the Fig. 6 is based on the perspective from which they are studied. The findings reveal that a significant number of papers, totalling 148, focus on the viewpoint of providers, demonstrating a considerable interest in understanding planned obsolescence from the standpoint of producers and businesses where one study suggests that a monopolist who sells rather than rents his products will have an incentive [Waldman M. (1993)] to engage in planned obsolescence.

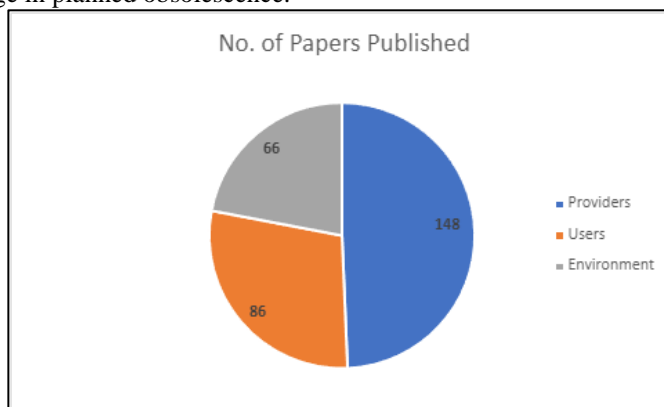


Fig.6: Perspective of study towards

Furthermore, 86 papers analyse the topic from the angle of users, underscoring the importance of consumer behaviour and engagements in discussions on planned obsolescence where a publication highlights potential avenues for incorporating e-waste management [Pera R.; Menozzi A.; Abrate G.; Et al. (2021)] into sustainable growth strategies. Additionally, 66 papers focus on the environmental

dimension, reflecting a growing concern for the environmental impacts of planned obsolescence where one study argues that Adaptive Reuse [Langston C.A. (2008)] could facilitate the achievement of sustainability goals without compromising investment levels or economic feasibility for the sector.

e. Author Keyword Co-occurrence Network

The analysis of the Co-occurrence Network illustrated in Fig. 7 investigates the author keywords related to planned obsolescence, with a focus on the frequency of occurrence and the strength of connections among specific keywords. In this dataset, the co-occurrence analysis identifies the presence of four clusters, each characterized by a distinct colour. These clusters can be delineated as follows: The red cluster addresses the 'Environmental and economic aspects of planned obsolescence, consumer behaviour, and product design, characterized by a higher density and keywords such as "planned obsolescence," "product lifetime," "electronic waste," and "recycling" that act as links to other clusters. The blue and green clusters demonstrate significant interconnections with the red cluster through keywords like "sustainability," "circular economy," "basel convention," and "bioaccumulation," reflecting a focus on sustainable practices, circular economy models, electronic waste management, recycling regulations, and environmental policies across various areas of product development.

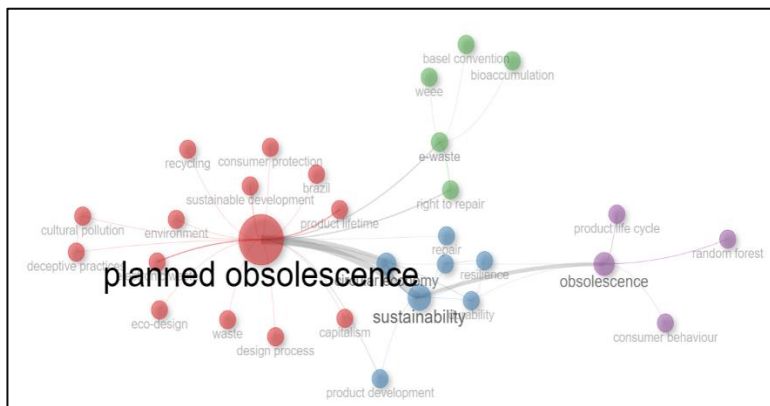


Fig. 7: Author Keyword Co-occurrence Network

This pattern emphasizes the significance of sustainable product design in impacting and steering business operations, promoting collaborative environments, research efforts, and the progression of ecologically aware product design focused on mitigating environmental damage and improving consumer welfare. The interconnectedness among the red, purple, and blue clusters implies a collaborative environment where sustainable practices, product development, and environmental policies intersect. The purple cluster is likely dedicated to discussions on "climate crisis," "product life cycle," and "consumer behavior," potentially exploring the impact of planned obsolescence on consumer behaviour, market dynamics, and product design strategies, implying that grasping consumer behaviour and evaluating product life cycles is crucial for addressing the challenges posed by planned obsolescence and its wider consequences. While the Red Cluster aligns most closely with the core concept of planned obsolescence, the blue, purple, and green clusters offer valuable insights into related topics and the wider consequences of planned obsolescence on sustainability, waste management, consumer behaviour, and product design.

f. Author Keyword Word cloud

The illustration in Fig. 8 depicts the distribution of keywords related to planned obsolescence in a word cloud analysis of author-provided keywords. The term "planned obsolescence" emerges as the most frequently utilized keyword, appearing 68 times, thus highlighting its significant importance within the context of the research. A study conducted by [Zhao Y.; Wang X.; Et al., 2021] having the keyword "planned obsolescence" revealed that while planned obsolescence benefits manufacturers, it covertly results in greater economic losses for consumers, necessitating the implementation of

appropriate countermeasures.



Fig.8: Author Keyword Word cloud

Furthermore, recurring keywords like "sustainability" and "obsolescence" are each mentioned 27 times, underscoring the focus on sustainable approaches and the implications of obsolescence. Research by [Langston C.A., 2008] with the keywords "sustainability" and "obsolescence" suggested that Adaptive Reuse could be a strategy to achieve sustainability goals without compromising investment or economic feasibility in the industry. Noteworthy keywords like "circular economy," "e-waste," and "durability" are also conspicuous, indicating a discourse on circular economic frameworks, management of electronic waste, and the longevity of products. The prevalence of these keywords mirrors the fundamental themes and ideas investigated in the examination of planned obsolescence, offering valuable insights into the principal subjects of interest and concentration within the field.

g. Conclusions drawn from research

Table 8: Conclusions drawn

Conclusion	No. of Papers Published
Planned Obsolescence Brings Advanced Technology to Producers and Helps Stay Updated with the Dynamic environment	87
Encourage Sustainable Production practices	73
Discouraged Planned Obsolescence	37
Encouraged Reuse/Repair/Prolonged use to ensure Sustainability and Consumer Welfare	29
Stronger Players Strategically Use Planned Obsolescence to Overpower competitors and Gain Profits	13
Obsolescence is a psychological phenomenon in consumers	11
Encouraged Concept of Durability	10
Encouraged Obsolescence Prediction	9
Planned Obsolescence is Outcome of Interaction between market actors	8
Encouraged Education of Product use and disposal	7
Encouraged Producers towards Environment Impact Reduction	7
Practice of Obsolescence should be conducted when it's crucial to adopt new Strategy	5
Planned Obsolescence Cannot beat Nostalgia oriented products	4

Table 8 summarizes the key conclusions derived from academic papers on planned obsolescence, encompassing a range of viewpoints and consequences of this phenomenon. A substantial body of literature, totalling 87 publications, posits that Planned Obsolescence Brings Advanced Technology to Producers and Helps Stay Updated with the Dynamic environment, thereby stimulating innovation within the industry. One such study delved into the essence of planned obsolescence and its relationship [Bulow J. (1986)] with product durability. Another focal point, with 73 publications, revolves around Encouraging Sustainable Production practices, as demonstrated in a paper by [Beccali, M; Bonomolo, M; (2015)] which suggested strategies for energy conservation and enhanced lighting standards. Conversely, 37 academic works Discouraged Planned Obsolescence, taking a critical stance on its consequences. For instance, one of these papers contended that the societal acceptance of non-durable goods is only feasible in a scenario of infinite resources [Maitre-Ekern E.; Dalhammar C. (2016)] and environmental resilience. Moreover, there is a notable emphasis on Encouraging Reuse/Repair/Prolonged use to ensure Sustainability and Consumer Welfare, as

evidenced by 29 studies. One such paper proposed a comprehensive sustainability framework for prioritizing adaptive reuse in urban development [Yung, EHK; Langston, C; (2014)], highlighting various social, environmental, economic, and political aspects in the revitalization of traditional shophouses. The tabulation also sheds light on strategic uses of planned obsolescence by stronger players, psychological aspects in consumer behaviour, and the importance of durability and obsolescence prediction. The findings illustrate the importance and complex implications of planned obsolescence and its extensive relevance in various sectors,

#### **4. Discussion and Conclusion**

This study concerning planned obsolescence provides a perspective on the various effects it has on different stakeholders.

As per the literature review, we find that there is a growing attention and emphasis on planned obsolescence in recent times particularly noticeable from 2010-2014 onwards supported by a significant surge in published works from 2015-2019 to 2020-2024. The region to produce the highest number of scholarly works was North America and was represented by the United States of America, with 91 papers being the highest contributing country from the region. The highest number of journals were published by Elsevier, Springer and Talyor & Francis. University of Maryland turned out to be the most influential institution in the discourse of planned obsolescence, and Goering G.E. was the most productive author in the field. Secondary Data Analysis Approach was seen as the most used approach in majority of the studies. A significant number of papers studied the research area of Environmental Sciences & Ecology followed by Business & Economics showing a higher preference towards environmental concerns. Majority of the work was done to study about planned obsolescence and its impact on Consumer products followed by Waste implying the need to control the obsolescence on the product level primarily which can indirectly have an impact on the waste generation in the environment. Most of the papers studied this concept from the perspective of manufactures, followed by consumers and least from the standpoint of environment indicating an opportunity to see this phenomenon through the lens of environment. An overwhelming number of research came with the conclusion that Planned Obsolescence Brings Advanced Technology to Producers and Helps Stay Updated with the Dynamic environment and to its very next was a significant number of studies Encouraging Sustainable Production practices

From the standpoint of manufacturers, planned obsolescence may yield advantages by generating higher profits and fostering innovation. Nevertheless, it carries adverse outcomes for customers and the ecosystem, leading to the generation of electronic waste and environmental deterioration.

The research highlights the requirement for adopting more sustainable manufacturing methods and improving consumer consciousness to mitigate these unfavourable outcomes.

#### **5. Implications and Limitations of the Study**

The phenomenon of planned obsolescence, as outlined in this paper, is a technique employed by corporations to guide consumer behavior and increase profits by intentionally manufacturing goods with restricted durability as it has its own incentives [Waldman (1993)] which motivates the manufacturers to intentionally outdate the existing technology thereby boosting the sales of the new one, but sometimes planned obsolescence may not work for some like in the case of vinyl's having significance in independent communities, portraying it as the "king format" symbolizing quality, authenticity, and effort in music, [Bartmanski and Woodward (2018)] contrasting its longevity with the market's economic dynamics, which points out that product replacements are not solely dictated by designers or marketers [Wieser (2016)] but are constantly shaped through interactions among market actors, and the psychology of consumers towards new product acting as an adopter and non-adopters [Venkatesh and Brown (2001)] of new technology based on their belief in latest changes or fear or having the existing technology go out dated.

This strategy has significant economic consequences, resulting in increased consumer expenditures as

individuals are encouraged to make more frequent purchases of new goods. Nonetheless, it also gives rise to environmental issues, leading to waste and contamination when discarded products find their way into landfills. The fashion industry deals with challenges in managing the supply chain and making projections due to rapidly evolving trends fuelled by planned obsolescence. Researchers are emphasizing the need for companies, policymakers, and consumers to prioritize durability [Jensen et al. (2021)] over disposability which calls for role of sustainable practices like circular economy [Crafoord et al. (2018)] and environmental assessment [Tuccio et al. (2017)] in mitigating the environmental consequences of obsolescence. Since the recycling practices often fail to address the production tempo [LeBel (2016)], perpetuating the cycle of obsolescence, there is a need for businesses to stay proactive [Kang et al. (2012)] estimating the optimal duration of platform use, aiming to maximize profits and lifespan even before the platform is designed, forecast the procurement lifetime and obsolescence date of technologies [Sandborn and Prabhakar (2011)], strategically plan [Purohit (1994)] new product introductions, including product replacement and line extension, formulate optimal policies [Carrillo and Franza (2006)] for time-to-market and ramp-up time decisions, indicating a methodical approach to managing product lifecycles. Ensure just-in-time production and dynamic inventory control for profitability [Bonney (1994)], suggesting efficient inventory management, manage supply chain, design, and planning to mitigate obsolescence risks [Rojo and Roy (2010)] and maintain cost efficiency [Ritschard (1998)] as a response to the challenges posed by obsolescence.

Despite the obstacles posed, planned obsolescence is perceived as a mechanism for fostering economic expansion and creativity, as it motivates consumers to embrace fresh technologies and fashions [Venkatesh and Brown (2001)]. Nevertheless, there is a growing call to address the environmental and societal impacts associated with planned obsolescence, with certain nations going as far as to outlaw this practice. It is important that policies are formulated that ensure minimum performance standards, labeling, and warranties in addressing product durability and longevity [Richter et al. (2019)] along with educating the consumers about the toxicity of second-hand electronics, which overshadows the occupational health risks associated with improper e-waste management [Adeola (2018)], indicating a lack of awareness about the environmental impact of planned obsolescence. Firms need to Adopt innovation [Albert (2019)] that aligns with durability and longevity, and work towards end-of-life management [Deng and Giesy (2017)] of the waste that gets accumulated to the planned obsolescence.

The studies done on planned obsolescence collectively highlights the intricate interplay between economic, environmental, and social factors in the phenomenon of planned obsolescence, calling for a holistic approach to product lifecycle management that prioritizes durability, sustainability, and consumer welfare over short-term profitability and disposability.

Ultimately, the decision to continue or halt planned obsolescence depends on achieving a balance between the economic benefits and the environmental and societal factors involved.

One limitation of the study is that it may have received more insights which remained unknown due to the inaccessibility of the research papers for the literature review. Secondly to know how things work in case of planned obsolescence there is a need to delve into the practical research which a literature review may not be able to fully explain using a secondary data analysis.

Future research could explore the social dimensions of planned obsolescence and its impact on consumer behaviour and society. A very few numbers of research have proven that Planned Obsolescence Cannot beat Nostalgia oriented products which leaves some gap to understand the role of nostalgia in repelling planned obsolescence. Human behaviour can be one interesting subject to be investigated to study how it works in the case of planned obsolescence.

Table 9 Insights from Literature studies

Appendix: Insights from Literature studies (Compiled by the Author) The dynamic relationship between inputs, mediators, and outcomes as identified from the referenced studies, curated to provide comprehensive insights into the subject matter						
Sr. No	Study and Country	Sample	Inputs	Mediators	Outcomes	Key findings
1	(Akhshik S.S.; Parirokh M., 2016) Iran	FUM librarians (40), middle managers (11) and senior managers (5).	Factors affecting unlearning during organizational change	Individual and organizational driving and restraining forces	Effect of lack of awareness and motivation on resistance to change	Barren organizational context had a greater impact on resistance to change. Knowledge stickiness factors influenced resistance to planned change.
2	(ALKHATIB, WG; BUKHRES, O; Et al. 1995) USA	200 Software Practitioners	skills assessment for software practitioners	Technological change	Skills assessments improve productivity and steer university curricula.	Object-oriented and client-server technologies are rated as critical skills
3	(Amolo J.; Beharry-Ramraj A., 2016) South Africa	172 participants from age group of 20-29, 30-39, and 40-60	Consumer attitudes and perceptions of lifestyle brands	Age of consumers	Factors influencing consumer loyalty and purchase decisions.	Consumers remain loyal to brands despite knowing about planned obsolescence. Age affects purchase decisions, with older individuals being more cautious.
4	(Angeli L.; Laconich J.J.J.; 2020) Italy	19 Computer Science students	Student knowledge	Learning methodology : Learning by Teaching (LbT) is a mediator for student empowerment. Actor-Network Theory (ANT) is used as a mediator in education	Redesigned course empowered students, increased motivation, and reduced perceived load. Students took ownership, developed soft skills, and broadened technical knowledge	Constructivist redesign empowered students, broadened content, and updated tools. Teacher's role as a mentor and facilitator is crucial in AL
5	(Antoniazzi L., 2021) Italy	28 semi-structured elite interviews	Digital preservation within European film heritage	Technological change	Lobbying for funding and support to implement best practices is recommended.	Film heritage institutions struggle with sustainable digital preservation solutions. Lack of strategic coordination and standardization in digital preservation initiatives. Challenges include high costs, customization issues, and tensions between personnel. European film archives need a united strategy for digital preservation infrastructure.
6	(Badami N., 2018) India	N/A	Informal repair practices and jugaad in India	N/A	Jugaad and repair are conceptually distinct labor practices. Repair can be formalized and legitimized, unlike jugaad.	Jugaad is a shared set of sensibilities and practices in India. Repair practices in India are informal and innovative. Repair cultures in India involve repurposing objects creatively
7	(Bartmanski D.; Woodward I., 2018) Denmark ; Germany	N/A	Cultural significance and market dynamics of vinyl	Record stores	Vinyl record retains cultural significance and resists planned obsolescence.	Vinyl record's iconicity is maintained through cultural, historical, and spatial entanglements. Vinyl's revival in mainstream culture showcases its enduring appeal and significance. Vinyl's status as a market celebrity reflects performative construction of commodities. Vinyl's trajectory from hegemonic format to revived status is celebrated iconically.
8	(Bhattacharya S., 2018) India	N/A	Post-life transactions of the disposed, discarded, displaced, and dismantled products	Waste Disposal	Manufacturing and consumption contribute to over 50% of carbon dioxide emissions.	Waste in India has an afterlife, reused in low-cost urban infrastructures. Gadgets' disposal creates health hazards, leading to environmental debris.

					The disposal of waste is linked to production and consumption	
9	(Borthakur A.; Singh P., 2022) Belgium ; India	1039 respondents in the age group of 18–22 from New Delhi	Consumers' perspectives on electronic waste	Functional need	Consumerism drives purchase of new electronics, contributing to E-waste generation.	Young adults prioritize functional need when purchasing mobile phones. Majority change mobile phones within 1-3 years, discarding them prematurely. Repairing old products is more environmentally friendly than disposal
10	(Brönneke T., 2017) Germany	N/A	Directive 1999/44/ec for consumer goods	N/A	Revision of Consumer Sales Directive offers chance to tackle premature obsolescence.	Legislative measures to counteract premature wear and tear of consumer goods. Three key levers against avoidable obsolescence: buyer rights, information requirements, product legislation.
11	(Byun, N, 2019) South Korea	1:1 interviews with the representative or manager of 9 residential welfare facilities	Fire safety issues in planning of elderly residential facilities in Korea. Analysis of spatial planning and layout in elderly residential facilities	Fire safety	Highlighted fire safety issues in planning of elderly residential facilities	Fire safety issues in elderly residential facilities due to obsolescence and size. Lack of proper instructions and concrete evacuation plans in smaller facilities. Elderly residential facilities in Korea face inadequate safety plans for daily living
12	(Caratozzolo P.; Sirkis G.; Et al., 2020) Mexico ; Spain ; USA ; Argentina	135 Engineering students	PreTest skills levels	Skills obsolescence and knowledge	Engineering education must adapt to mitigate skills obsolescence in technology.	Skills obsolescence is a global risk with devastating effects. Employers need new strategies to address technology obsolescence in engineering.
13	(Carbonell-Nicolau O., 2023) USA	N/A	Market-driven technology adoption under negative external effects	Technology adoption effects	Monopolist prefers inferior technology, leading to negative profits	Market-driven technology adoption is socially inefficient due to negative external effects. Monopolist's profit maximization favors technology A over B. Competitive equilibrium results in overall deadweight loss. Entrant gains from adopting technology B for production.
14	(Chinis, I; Pozoukidou, G; Et al., 2021) Greece	N/A	Urban resilience and community-driven spatial planning practices	Spatial planning	Emphasizes community value for non-capital urban change	Urban resilience emphasizes community-driven, non-capital-oriented urban change. Emergence of resilience concept highlights bottom-up urban planning initiatives.
15	(Colombijn F.; Egboko P., 2023) Netherlands	17 repairers at the repair café	Behaviour of the volunteer-repairers and the people bringing objects in need of repair a form of capitalist abstinence	Repair cafes	Repair cafés motivate visitors to lead more sustainable lives.	Repair cafes challenge capitalist production by extending object life cycles. Repair cafes appeal to older generations due to upbringing values. Repairers face challenges due to design complexity and unavailability of spare parts. Repair cafes can benefit from active social media presence for intergenerational transfer.
16	(Cooper T., 2004)UK	802 households in the UK	Consumer attitudes and behavior on appliance life spans.	N/A	Consumers play a crucial role in reducing appliance waste.	Majority of discarded appliances are under 5 years old. Householders are divided on whether appliances last long enough. Concerns about appliances becoming outdated deter long-lasting purchases. Repair costs discourage householders from fixing

						appliances.
17	(Díaz, JMS; Quintana, TA; Et al., 2020) Spain	Sample consisted of 5 selected case studies out of 17 analyzed	Rehabilitation processes in tourism	Accommodation for tourism	Rehabilitation model improved competitiveness through upgrading strategy	Case study methodology analyzed rehabilitation processes in tourist establishments. Profitability, positioning, and prestige online were key elements assessed.
18	(DiMatteo L.A.; Wrbka S., 2019) Austria ; US	400 websites on which EWSCs were offered on electronic goods	Discusses contract law, consumer protection, and regulatory landscapes	Extended Warranties and Service Contracts	Planned obsolescence generates profits, reduces product durability, and limits competition.	Proposed bills aim to ensure spare parts availability for 5 years. Inconsistency in regulatory schemes between manufacturers and third-party insurers.
19	(Echegaray F.,2016) Brazil	806 adult Brazilians residing in major cities	Consumer reactions to product obsolescence in Brazil	Psychological obsolescence, subjective utility, and deliberate curtailment	Consumers' reactions to product obsolescence are influenced by psychological forces	Brazilians accept product obsolescence without dissatisfaction. Consumers replace devices due to subjective obsolescence more than technical failure. Consumers adapt to imbalance between high durability expectations and low performance. Consumers' reactions to product obsolescence in Brazil are naturalized.
20	(Farhey, DN, 2006) USA	N/A	Evaluation methodology for functionally obsolete bridges.	Bridge management.	Cost components of traffic congestion discussed for better design considerations.	Functionally obsolete bridges impact safety, mobility, and traffic congestion significantly. Advanced bridge management requires integrated solutions for increased sustainability.
21	(Fletcher, K, 2012)UK	N/A	Garment longevity influenced by user behavior and social dimensions	Social preferences	Durability in fashion is an outcome of user practices	Durability in fashion is user-based, not product-based. Garment lifespan influenced by social actions and human relations. Fashion sustainability involves social practices and human actions
22	(Foster J.E.; Horowitz A.W., 1996) USA	N/A	Explores the impact of complimentary textbook sales.	Complimentary copy sales	Increased complimentary copy sales extend optimal edition life, lowering textbook prices.	Increased sales of complimentary copies extend edition cycle, lowering mean prices. Publishers' assertion that complimentary copies raise prices is contradicted
23	(Freitag, RMK, 2022) Brazil	1,870 speech recordings	Linguistic samples are collected for sociolinguistic documentation projects	N/A	Comparison of linguistic repositories to assets for sustainability and longevity	Challenges in building linguistic repositories for sociolinguistic research. Importance of partnerships with IT and private companies for sustainability. Difficulty in anonymizing participants in sociolinguistic interviews. Funding challenges for linguistic data collection and repository maintenance
24	(Frisson C.; Kirkegaard M.; Et al., 2022) Canada ; France	N/A	Open-source toolchain for audio and haptics	Haptic feedback technology	ForceHost toolchain enables audio-haptic firmware applications with web-based UIs.	Faust language supports haptics and real-time audio processing. Web-based UIs are used to expose parameters of audio-haptic firmware. ForceHost enables stable audio and haptic loops independent of OS.
25	(Golob, JM; Stecher, CC; Et al., 2003) USA	N/A	Technology obsolescence, software documentation, and funding barriers	Stakeholder involvement and cooperation	Educating senior management on infrastructure requirements is crucial	Plans conform to National ITS Architecture guidelines. Deployment requires time, money, and visionary leadership
26	(Gosselin A.M.; Berthelot S., 2023) Canada	N/A	SNC-Lavalin's corruption scandals and rehabilitation efforts.	N/A	SNC-Lavalin took steps to overcome recurring corruption problems. The	SNC-Lavalin's steps align with Alcoholics Anonymous' 12-step program. The company's rehabilitation efforts show potential for other firms. SNC-



					company's legitimacy with stakeholders was partially restored	Lavalin's progress in overcoming corruption issues is noteworthy.
27	(Gostin, LO; Sapsin, JW; Et al, 2002) USA	N/A	Public health responses to bioterrorism threats	N/A	The Model Act enhances state powers to detect and contain outbreaks.	The Model State Emergency Health Powers Act enhances public health preparedness. Fragmented public health laws hinder efficient multistate emergency responses. Surveillance gaps exist for critical bioterrorism agents in many states.
28	(Guarnieri P.; Vieira B.D.O.,Et al.; 2022) Brazil	1509 Brazilian consumers of electrical and electronics equipment	iPhone resale prices and consumer behavior in secondary markets.	Level of awareness and knowledge of Brazilian legislation related to e-waste management among consumers	iPhone prices decline by 2.8-3.2% monthly, no accelerated decline after new launches	iPhone prices decrease predictably with age, no sharp decline post-launch. Consumers are rational and forward-looking in durable goods markets.
29	(Gutiérrez, E; Adenso-Díaz, B; Et al., 2011) Spain	1537 Spanish households	Household appliance replacement behaviors.	Geographical location	Household size influences the replacement of refrigerators and iron malfunction	Household size influences appliance lifetimes. Competing risks model predicts appliance replacement probabilities. CR-SA model estimates appliance lifetime distribution for various replacement causes.
30	(Hartl R.F.; Kort P.M.; Et al., 2023) Austria ; Netherlands ; Belgium	N/A	Planned obsolescence, warranty, and consumer protection	Warranty period, reputation, and product lifetime.	Effect of warranty period on product lifetime and consumer behavior.	Warranty period has an inverted U-shaped effect on product lifetime. Consumers demanding warranty rights can increase product lifetime. Installing a warranty period may reduce product lifetime
31	(Hennies L.; Stamminger R.,2016)Germany	1075 German households	Data on maintenance and discarding history of appliances	Consumer awareness of ecological factors	Satisfaction increases with longer lifespan of appliances	Lifespan of products close to consumer expectations. Consumers play a crucial role in extending product lifecycle. Obsolescence is a shared responsibility between manufacturers and consumers.
32	(Jang E.; Johnson M.; Et al., 2017) USA	N/A	Hardware and software maintenance, repair, and replacement components. Longevity and care of hardware in use and storage.	Environmental control and device mobility	Development of flexible user-centric security paradigms.	Challenges in maintaining hardware and software in post-collapse scenarios. Longevity and care of hardware, flexible security paradigms, and secure distribution. Existential threats to computing capability in limited replacement part environments.
33	(Kostek R.; Samek K., 2018) Poland	212 Students of University of Science and Technology in Bydgoszcz	Defects and problems with smartphones reported by users	Customer satisfaction levels with the quality of smartphones	Durability of Smartphones estimated between 30.7 to 35.6 months	Smartphones face defects like freezing, scratched screens, and weak batteries. Planned obsolescence leads to limited smartphone lifetimes and defects.
34	(Kuppelwieser V.G.; Klaus P.; Et al.,2019)Monaco ; France	42 US based customers in one group, 220 and 93 in second and third group.	Scenarios about smartphone replacement time decisions	Perceived value of a smartphone offer.	Replacement time influences product value perception and willingness to pay.	Planned obsolescence strategy harms customer value perception and willingness to pay. Replacement cycles influence customer value perceptions and behavioral intentions. Longer replacement periods increase value perception and willingness to buy.
35	(Lee I.H.; Lee J., 1998)UK ; Korea	N/A	Analyzes equilibrium, price discrimination,	Investment in innovation	Underinvestment in innovation may	Economic obsolescence drives durable goods monopolists to

			and innovation impact on the market.		occur due to fear of cannibalization	implement price discrimination. Intra-type and inter-type price discrimination affects consumer surplus equilibrium
36	(Liu Z., 2023) Canada	Interview with 13 consumers from various backgrounds since the Mao era	Consumer behaviors and emotions related to the national bedsheet	Perceived value of consumer items	The national bedsheet's continued significance post-Mao era in Chinese society.	The Minguang bedsheet embodies defining characteristics of the Maoist system. The peony pattern symbolizes harmony, romance, and happiness in China. The material properties of national bedsheets represent the Maoist system.
37	(Madden S., 2014) USA	N/A	Impact of obsolescence on digital writing tools in research and pedagogy	Pricing and exchange value	Design decisions affect product life cycle and material circulation post-use.	Obsolescence of writing tools threatens research and pedagogy in writing studies. Scholars should apply critical pressure to obsolescence in technology design. Rapid obsolescence of writing tools is seen as natural and inevitable. Minority access to technology is challenged by planned obsolescence
38	(Maggiolino M., 2019) Italy	N/A	Planned obsolescence legal rules and strategies	N/A	Planned obsolescence can impact consumer debt levels and natural resource waste	Planned obsolescence is a result of entrepreneurial choices. Legislators should develop tools to punish planned obsolescence directly
39	(Makov T.; Fitzpatrick C., 2021) Israel	3,541,554 iPhone benchmarking test scores	Smartphone lifespans and consumer behavior.	Factors influencing consumer perception of product desirability and sustainability	Repairability alone may not extend smartphone lifespan effectively.	Objective performance of smartphones remains stable over time. Interest in smartphone repair declines over time, regardless of repairability. Mental depreciation plays a critical role in determining smartphone lifespan
40	(Malinauskaite J.; Erdem F.B., 2021) London	N/A	Planned obsolescence, circular economy, and legal insufficiencies	N/A	Addressing planned obsolescence requires a holistic legal approach	Planned obsolescence impacts sales, environment, and competition in various markets. EU legislation lacks direct prohibition of planned obsolescence, focusing on related laws. Circular Economy Action Plan aims to enhance product durability and reparability. Ecodesign rules promote reparability, recyclability, and waste reduction in appliances. European Commission explores a scoring system to rate products' reparability.
41	(Mandal G., 1984) India	N/A	Insights on the role of ceramics in the Indian economy.	Role of ceramic engineering education and the ceramic industry in the Indian economy	Emphasizes the need for ceramic engineering graduates to meet industry demands.	Ceramic engineering graduates have ample job opportunities. Curriculum enhancement can improve ceramic engineering education
42	(Mandal P.C., 2023) India	N/A	Social implications and criticisms of marketing practices.	Impact of marketing practices on individual customers, society, and other businesses	Negative effects of poor-quality products on consumer trust and satisfaction	Marketing practices may harm society and competition. Planned obsolescence is driven by consumer demand for innovation. Deceptive practices include false advertising and misleading pricing strategies
43	(Marien, M, 2007) USA	N/A	Emphasizes the need for systematic identification of human benefit knowledge	N/A	Proposals include comprehensive coverage, user-friendly features, and ample	The World Brain for the 21st century should have seven features. Fragmentation persists despite cross-disciplinary efforts, hindering knowledge

					publicity.	organization. The second type of human benefit knowledge is disorganized and fragmented
44	(Martin, KE, 2004) USA	76 agency staff in 27 executive, legislative, and judicial agencies	Publishing trends within North Carolina state government	Publishing and information management policy	Recommendations for managing digital government information for preservation and access.	Challenges in preserving digital state publications for public access. State Library of North Carolina initiated a research project for preservation. Recommendations for state libraries to preserve digital government information. State agencies disseminate information digitally, posing challenges for preservation
45	(Mayoral-Vilches V.; Glera-Picón A., Et al.; 2021) Spain ; Italy ; Austria	N/A	Robot teardown to study hardware, uncover vulnerabilities, and address planned obsolescence	Use of commercial off-the-shelf components to mitigate security issues in robotics	Advocacy for 'Right to Repair' in robotics to empower end-users	Robot teardown reveals security flaws and planned obsolescence in hardware. Manufacturers discourage repairs to avoid competition and employ planned obsolescence.
46	(McKellar S., 2022) UK	N/A	Consumer representation in 1930s' America.	N/A	Establishment of a Consumers' Standard Board.	The consumer did not receive support within the NRA. Schlink criticized the inadequacy of the government and the CAB
47	(Mead J., 2023) USA	N/A	Socialist-era domestic appliances and gender culture.	N/A	Critical role of materiality in the legacy of socialist electronics.	Czech hobbyists restore socialist-era electronics due to durability and simplicity. Socialist appliances are linked to technical masculinity in Czech society
48	(Miao C.-H., 2011) USA	N/A	Welfare implications of planned obsolescence in monopoly undersupply situations	Incompatibility between product generations	Planned obsolescence can enhance social welfare by alleviating monopoly undersupply	Monopolist's incompatibility between products can enhance social welfare. Incompatibility may alleviate monopoly undersupply issues, benefiting society paradoxically. Planned obsolescence can lead to higher social welfare in markets.
49	(Minovic, M; Milovanovic, M; Et al., 2014) Serbia	13 experts from Anti-corruption agency of Republic of Serbia (ACA) and employees in Public procurement office (PPO).	Semantic technologies, rule-based surveillance system, data analytics, corruption detection	Implementation of technology in the procurement process to enhance transparency and efficiency	Proposed rule-based surveillance system for monitoring public calls effectively	Semantic technologies used to prevent corruption in public procurement. Decrease in trust towards public procurement due to corruption and irregularities. Proposed meta-models and domain-specific language for alert rules in procurement
50	(Nyman L.; Mikkonen T.; Et al., 2012) Finland	N/A	Open source software, code forking, sustainability, and project governance.	Concept of code forking in open source software development	Code forking ensures software sustainability and community-driven innovation.	Forking in open source software ensures sustainability and community-driven development.
51	(Oh, HJS, 2018) Canada	11 semi-structured interviews with teachers and administrators	It explores the shift from subject to skill-based education in a South Korean international school	Concept of resilience	Shift from subject to skill-based education to navigate capitalism's uncertainties.	Shift from subject to skill-based education in South Korean international school. Resilience valued as a character trait for uncertain future scenarios. Investment in new school to transform Korean education and prepare for future. Williams International aims to produce elite status from capitalism's chaos. Williams International is a speculative experiment to escape obsolescence.
52	(Olejník L., 2020) Belgium	N/A	Web privacy impact assessment of Ambient Light Sensor API.	N/A	Risks identified and averted through privacy risk assessment of light sensor	Risks of web browsing history theft and data exfiltration identified. Ambient Light Sensor API demonstrated potential for cross-origin

					API.No web browser decided to ship the API due to risks	resource theft. Privacy risk assessment led to the avoidance of shipping the API
53	(Pera R.; Menozzi A.; Et al., 2021) India	5 best-selling video games of similar genre	Consumer innovation in video game modding. Netnography method used to explore motives for value codestruction	Impact of consumer community size on motivations to create Consumer-Generated Content (CGC)	Explored the relationship between modders and producers, players, and other modders.	Competition in online consumer innovation communities initially motivates cocreation. Competitive pressure from existing mods limits the innovation process. Misbehaviors like lack of support and content appropriation lead to discontent.
54	(Perry A., 2017) USA	433 participants recruited from Amazon Mechanical Turk	Factors influencing purchase intention: aesthetics, function, compatibility, social influence	Examine how various factors influence consumers' purchase intention of smart closets	Factors influencing purchase intention: aesthetics, function, compatibility, social influence.	Compatibility and social influence are key determinants of purchase intention. Fear of obsolescence can enhance social influence and purchase intention.
55	(Petrina S., 2017) Canada	N/A	Moving students from critical self-reflection to social critique in design	Concept of transfer from crit to critique	Lack of clear cases on how DT education moves students to critique. Disconnection between documenting practice and theorizing critique in DT education.	Moving students from crit to social critique in design and technology. Schön's work provides insights into transferring activity to activism. Critique of relations among people and things in design and making. Challenges in documenting what students transfer from crit to critique.
56	(Philip R.S.; Anian A.M.; Et al., 2020) Indiana	990 consumers randomly selected through Facebook	Fast fashion and supply chain uncertainty	Social media platforms	Fast fashion leads to uncertainty in the supply chain. Sustainable fashion is seen as a viable alternative to fast fashion	Media plays a crucial role in altering customers' perceptions. Sustainable fashion is a better option than fast fashion.Uncertainty in the supply chain can impact overall organizational performance. Circular economy schemes require collaboration among all supply chain participants.
57	(Polinori, P, 2019) Italy	715 interviews with local residents	Wind energy deployment and valuation	Perception of risk	Offer insights for planning and designing enlargement schemes for wind energy	Wind farm enlargement is crucial for further growth in wind energy. Respondents willing to support enlargement due to positive externality.
58	(Proske M.; Winzer J.; Et al.,2017) Germany	N/A	Planned obsolescence, consumer beliefs, smartphone functionality, repair costs, provider contracts	Independent repair services, spare part producers, and repair cafes	Factors influencing smartphone obsolescence: repair costs, battery life, new features.	Planned obsolescence due to fast product cycles and new features. Consumer perception of planned obsolescence as a market reality. Broken screens and battery issues common in smartphones. High repair costs due to design and limited availability of parts.
59	(Rahm-Skågeby J.; Carlsson A., 2021) Sweden	3 interviews with prominent archivists	Retrocomputing databases and cultural techniques.	Concept of cultural techniques and ontic operations within the context of the retrocomputing archive, specifically focusing on the Commodore 64 scene database (CSDb)	Cultural techniques shape and transform knowledge and social memory in archives	Retrocomputing databases manage collective digital archives and memories effectively. CSDb (Commodore 64 Scene Database) is a significant platform for archiving Commodore 64 artifacts
60	(RULE, JB, 1990) NewYork	N/A	Sociological trends, theoretical movements,	Influence of historical	Theoretical shifts in sociology	Constant flux of theoretical change may indicate a long-term

			and intellectual progres	periods and cultural revolutions on shaping sociological worldviews	reflect influences from political and cultural environments.	progressive tendency
61	(Saengchote K.; Nakavachara V., 2018) Thailand	Data of over 320,000 used iPhones listings in Thailand	Impact of planned obsolescence on iPhone prices in Thailand	Consumer anticipation and forward-looking behavior in response to planned obsolescence in the smartphone market.	Prices decline by 2.8-3.2% monthly, no accelerated decline after new launches.	iPhone prices decrease predictably with age, no sharp decline post-launch. Consumers are rational and forward-looking in durable goods markets
62	(Sailaja N.; Castle-Green T.; Et al., 2023) UK	N/A	The workshop focuses on repair practices and sustainability of IoT devices	Collaborative and interdisciplinary approach to addressing repair challenges in smart devices	Spark dialogue on repair in IoT devices for sustainability	Workshop aims to explore repair challenges in IoT devices. Focus on legal, social, technical, and design aspects of repair practices. Participants map key research questions for more repairable technology. Recruitment via position paper or online form to maximize inclusivity.
63	(Schreiber D.; Hupffer H.M.; Et al., 2022) Brazil	N/A	Influence of advertising on the perception of obsolescence.	N/A	Advertising influences consumer perception of product obsolescence, stimulating unsustainable behavior.	Programmed obsolescence supported by social changes, individual competition, and weakening bonds. Hermeneutic approach used to analyze social and cultural phenomena. Sustainability awareness may lead to changes in consumer behavior
64	(Short C., 2021) NewZealand	N/A	The Ulm School of Design discourse relevance to Sustainable Design.	Integration of design principles and practices from the Ulm School of Design with contemporary sustainable design approaches.	Validation of Ulmer ideas against contemporary Sustainable Design hallmarks	Ulmer discourse aligns with contemporary Sustainable Design values. Designers should consider social equity, resource optimization, and environmental respect. Ulm School of Design aimed to educate socially conscious designers. Design should improve human lives and have a social sustainability aspect. Contemporary design discourse emphasizes fair distribution and social sustainability
65	(Skågeby J., 2019) Sweden	292 media and communication students	Digital media breakdown incidents in everyday life.	Analysis and interpretation of critical incidents related to digital media failure against the backdrop of 'cyber-optimism' and 'cyber-pessimism	Users show ambivalence but are techno-solutionists in digital breakdowns.	Analysis revealed tensions in digital media failures. Incidents often sequential, leading to multiple problems
66	(Soto-Pineda J.A., 2021) Colombia	N/A	Discusses litigation against Apple for planned obsolescence	Legal actions taken against technology companies	Increase in technological planned obsolescence globally	Private actions against Apple for planned obsolescence in the US. Consumers lack knowledge exploited by Apple to increase demand.
67	(Steinzor R.I.; Hornstein A.D., 2002) USA	N/A	Process of enabling law schools update their curricula	N/A	Changing needs in curricula to be addressed through continous reforms	Continous reform of curricula is the only way law schools will be able to respond to changing needs of their particular consumers.
68	(Strausz R., 2009) Germany	N/A	Discusses planned obsolescence as an	Concept of unobservable	Planned obsolescence	Planned obsolescence can enhance quality incentives for

			incentive device.	quality as a signal for planned obsolescence.	serves as an incentive device for unobservable quality	consumers. Reduced durability can lead to stronger quality provision incentives.
69	(Strielkowski W.; Streimikiene D.; Et al., 2019) Czech Republic ; Lithuania ; Russia	N/A	High-renewables electricity system market design.	N/A	Increased efficiency, demand management, and supply-demand matching for cost reduction.	IoE facilitates peer-to-peer energy exchange in high-renewables electricity systems. Smart power innovations can save UK consumers up to PS8 billion by 2030. Large hydropower plants have the lowest electricity costs.
70	(Su Y.; Hwang J.-S., 2020) Taiwan	249 females and 245 males.	Customer satisfaction and usage times of popular smartphones.	Customer satisfaction and sustained usage time	Measure of cumulative customer satisfaction over time for evaluating products.	Proposed method integrates sustained usage time and customer satisfaction. Market value assessment of popular smartphone brands in Taiwan. Relative market values of Sony, Samsung, HTC compared to Apple iPhone
71	(Subramanya T.R.; Saroj N., 2023) India	N/A	Right to Repair' legislation in India.	Individuals and third parties like repair shops.	The right to repair promotes consumer independence and sustainability.	The right to repair legislation is crucial for consumer empowerment. India lacks formal recognition of the right to repair. The right to repair aims to reduce e-waste and promote sustainability. Planned obsolescence negatively impacts consumers and the environment.
72	(Tabb, CJ, 2013) USA	N/A	The research paper discusses secured creditor rights in bankruptcy proceedings.	N/A	Need to restore balance in secured creditors' rights.	Chapter 11's credit bidding right for secured creditors is significant. Recent cases have challenged secured creditors' credit bidding rights. The balance of power between debtors and secured creditors has shifted. The RadLAX case will address the credit bidding dispute. The 1978 Bankruptcy Code's balance has become obsolete.
73	(Tang, LE; Chen, C; Et al., 2022) Hong Kong ; China	N/A	The research focuses on BIM GIS-integrated method for urban underground piping.	N/A	Enhances management efficiency digitally, integrates sensor data with BIM and GIS	Proposed method integrates BIM and GIS for urban underground piping. Real-time monitoring with piping sensors enhances underground piping management. Identification of critical information needed for underground piping asset management. Heterogeneous data integration between BIM and GIS platforms is efficient. Challenges faced in the case study due to government ownership.
74	(Tokić K.; Tokić I., 2015) Croatia	N/A	Explores the impact of technology on information literacy in society.	Planned obsolescence and technology development	Planned obsolescence impacts information literacy due to constant technology changes.	Information literacy is crucial for social participation and inclusion. Technology progress accelerates skill obsolescence, especially in information literacy. Digital technologies have significantly influenced global societies and economies.
75	(Tu M.-H.; Chang P.; Et al., 2018) Taiwan	120 staff using old devices and 86 using new devices	Staff perceptions of old vs. new handheld devices in healthcare.	Perceived ease of use and usefulness of the mobile health devices (HD1 and HD2) among the staff in long-term	Staff showed high acceptance of old device despite new device features.	Usability design crucial in preventing obsolescence of mobile handheld technology. Planned obsolescence strategy used to sell 'new and improved' products. Participants willing to use 3.9-in HD1 device due to ease. HD2 had preferable

				care settings		features over HDI in almost all aspects
76	(Utaka A., 2006) Japan	N/A	Research on durable goods marketing and obsolescence effects.	Obsolescence effect of marketing on older models of durable goods.	The influence of an obsolescence effect on the socially optimal level.	When considering consumer behavior, the equilibrium level of marketing exceeds the socially optimal level, leading to overinvestment in marketing. This overinvestment is driven by the stimulation of replacement demand due to a larger obsolescence effect
77	(Vehbi, BO; Hoskara, SÖ, 2009) Turkey	N/A	Focuses on sustainability and revitalization of historic urban quarters	N/A	Sustainability indicators reflect stakeholder concerns and address economic, social, environmental issues	Proposed model measures sustainability level in historic urban quarters effectively. Model tested in Northern Cyprus, leading to strategic sustainable revitalization. Direct link between revitalization and sustainability in physical-economic-social structures.
78	(Venkatesh V.; Brown S.A., 2001)USA	733 Households	Factors driving personal computer adoption in homes.	Attitudinal beliefs, normative beliefs, and control beliefs	Social outcomes important for earlier adopters than later adopters.	Factors driving PC adoption: utilitarian, hedonic, social outcomes. Nonadopters influenced by rapid tech changes and fear of obsolescence. Relationship between intent and behavior asymmetrical in PC adoption
79	(Ward, S, 2010) UK	N/A	Obsolescence in the cityscape of the former GDR	Economic value derived from a cost-benefit analysis in urban construction	Examination of the afterlife of obsolescent cityscapes in the 'new' Berlin.	The article explores visualizations of obsolescence in the cityscape of former GDR. Alternative visions of the cityscape are expressed in films and photography. Photography in the 1980s reflected upon obsolescence in the GDR. The film "Die Architekten" addresses the value of obsolescence in the GDR.
80	(West J.; Saunders C.; Et al., 2021) UK	10 Participants	Focuses on sustainable clothing and consumer behavior.	N/A	Cultural Theory used to suggest bottom-up solutions for sustainable fashion. Participants valued clothes more and gained confidence in altering items.	Wardrobe audits are effective tools to raise awareness in slow fashion. Participants' environmental attitudes influenced by social interaction and learning. Policy recommendations aim to close the value-action gap in fashion choices
81	(White P.; Fellmeth A.; Et al., 2021) USA	12 Lawyers	Focuses on US legal frameworks and product longevity.	Influence of planned obsolescence on product sellers' decisions regarding product durability and repairability	US legal system accepts planned obsolescence as profitable business practice.	Few legal protections against planned obsolescence for purchasers. Potential for expanding product lifespans through regulatory intervention.
82	(Wieser H., 2016) UK	7 Consumers	The paper discusses planned obsolescence and circular economy concepts	Role of consumer behavior and decision-making in the context of planned obsolescence and the circular economy.	Planned obsolescence involves deliberate strategies by suppliers to accelerate product obsolescence.	Planned obsolescence strategies in consumer goods industry. T-Mobile introduced JUHU campaign allowing phone upgrades every year. Manufacturers and service providers criticized for accelerating product obsolescence
83	(Yung, EHK; Langston, C; Et al., 2014) HongKong ; Australia	N/A	Focuses on adaptive reuse of traditional Chinese shophouses.	Balance between economic viability and	Social impact consideration could enhance	Adaptive reuse potential findings show no consistent relationships among eight cases.

				cultural significance for heritage buildings	adaptive reuse projects.	Adaptive reuse scores vary among projects, influenced by social considerations. Challenges in heritage conservation are prominent in Hong Kong's urban renewal. Shophouses with considerable heritage value are adaptable for various uses. Preservation of social value is sometimes more crucial than physical conservation.
84	(Zallio, M; Berry, D, 2017) Ireland	N/A	Investigation of technological development and planned obsolescence in Industry 4.0	N/A	Planned Obsolescence is a common practice in industrial production.	Design theories aim to extend product life and improve usability. Research reviewed various disciplines like Engineering, Social Sciences, and Economics
85	(Ziemeļniece A.; Ločmele A., 2022)Latvia	N/A	Focuses on revitalizing outdoor public spaces in historic town centers.	Balance between economic issues and cultural heritage preservation	Revitalisation of historic town centres through multi-sectoral strategies	Urban revitalization strategies enhance social, economic, and historical aspects of areas. Assessment methods help identify existing and potential developments in historic centers. Spatial analysis within 10-minute walking radius aids in development forecasting. Revitalization processes are crucial for historic city centers in the 21st century. Auce's revitalization focuses on restoring green lines and suppressing post-war development
86	(Zongwe D.P.; Mahantesh G.S.; Et al., 2023) India	N/A	Impact of broken screens on phone repairs in India and the US	Role of competition law and economic policies	India is the third largest e-waste generator globally.	Contribute to sustainable tech sector, especially in developing nations like India. Propose key principles for an optimal Right to Repair Act. Reduce costs of planned obsolescence on economy, society, and environment.

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