

Case Report

A Practical Approach to Companies' Transformation toward Product Longevity: A Best-Case Study

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Abstract: Product longevity is a key to improving the sustainability of production and consumption patterns. However, at many companies, extending product longevity requires overcoming several complex barriers. Identifying how to begin this process can be difficult; moreover, the available solutions may seem too complex or radical and, therefore, may be ignored as viable options. The purpose of this paper is to study the approaches and decision patterns that enable best-practice companies to produce high-longevity products. We aim to map approaches to implementing product longevity through a multiple-case study of 18 best-practice companies that systematically work to ensure product longevity. Through interviews with developers, CFOs and CEOs at companies that strive to design and produce long-lasting products, we identify three key types of approaches to implementing product longevity: performance-driven, behavioural change-driven and vision-driven approaches. This study reveals several types of approaches to implementing product longevity successfully. This contribution advances our understanding of how companies can engage with and foster product longevity at different stages of the development process.

Keywords: product lifetime; planned obsolescence; product durability; product lifetime extension; prolonged product life



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1. Introduction

As increased product consumption and surging e-waste, waste and energy consumption become increasingly global concerns [1], product longevity presents itself among a range of tools that can decrease the flow of materials. Extending the period that a product remains in active use lowers total consumption. However, the longevity of many consumer product categories is decreasing [2], and the average lifetimes of many product categories are decreasing. Previous findings have revealed that this decrease is likely due to a large number of barriers that hinder both businesses and consumers in maintaining or increasing product longevity [3]. Some companies have succeeded in branding themselves as able to produce long-lasting products and positioning themselves as producers of 'high-quality products' [4], mainly due to their continually overcoming such barriers. We define long-lasting products as 'products that are durable and considered to be useful and desirable by users for a long period of time, while simultaneously providing a viable business' [3].

Product lifetimes often fall far short of optimal ranges due to either planned obsolescence or a failure to understand or identify products' sustainability potential. Planned obsolescence [5] refers to the act of companies purposely shortening the lifetimes of their products. On the other hand, some products are able to remain relevant for the user longer than others. Moreover, companies can develop a better understanding of available options to increase, sustain and profit from initiatives that ultimately achieve higher product longevity. In practical terms, however, practitioners may perceive this transformation of perspective as filled with uncertainty regarding both the results and consequences of actions [6]; therefore, it remains inaccessible to many.

From an environmental perspective, a heightened focus on longevity is necessary to meet the UN global goals for sustainable development [7]. One way to approach these targets is to understand this transformation as a form of sustainable innovation, a perspective that relates to Chofreh and Goni's [8] comparison of sustainable innovation to organisational levels of decision making, as described by Montana et al. [9]. Product longevity, therefore, reflects companies' actions and corporate activities that support particular products.

While many scholars have explored how radical innovative initiatives, such as a total and sudden change in business model, can produce long-lasting products [10], other researchers argue that an incremental approach is necessary to allow consumers to adapt and accept the changes [11].

Many companies may face difficulties in identifying how to approach and succeed in developing this process because it involves many mutually influential factors that are often considered exogenous, such as the purchase behaviour of the customers [6]. Such difficulties affect the pace of the overall transformation to producing long-lasting products by hindering their implementation and development. Consequently, many researchers have argued for an incremental approach to extending product longevity, especially for companies that are vulnerable when engaging in radical changes in production [12]. Conny Bakker [13] describes how businesses' transformation toward longevity and changing business models to support longevity must be facilitated by incremental changes over long periods; however, a more descriptive and practical approach for companies is still lacking. The specific initiatives needed for each incremental step in this sustainable transition likely differ between product categories and even companies. A common understanding of the available solutions and their principles is, therefore, necessary.

Accordingly, a more rigorous investigation of how incremental changes, transformations within corporate structures and development approaches can help companies increase product longevity while maintaining a healthy and profitable business is crucial [14].

Incremental change and innovation within a company are often seen to emerge from many levels [15]. In line with Rivera and Lallmahomed [16], we adopt a focus on incremental changes at the tactical and strategic levels of companies' decision-making processes, particularly the decisions of top managers, other managers and designers. The strategic level describes the top management and the decisions pertaining to marketability, commercialization and marketing, while the tactical level describes management and design decisions, especially in regard to the design and management of products.

As described by Rivera and Lallmahomed [16], lower- and mid-level managers share knowledge and interact with top managers. This knowledge exchange is described as the *strategic level*. Likewise, designers obtain knowledge from consumers and governments through regulations and standards and also exchange knowledge with management. This knowledge exchange is described as the *tactical level*. Such knowledge exchanges, on the tactical level, represent the ideal space in which to foster incremental changes promoting product longevity.

Except for one study [17] of SMEs that investigated the drivers of and barriers to a circular economy, to the best of our knowledge, no comprehensive best-practice study across product categories has yet focused on product longevity. We investigate approaches to product longevity through an examination of tactics used among 18 best-practice companies that are either considered industry leaders or are seen to function as exemplars for other companies within their respective industries. The current paper, therefore, aims to answer the following question: **What are the tactical approaches and decisions within best-practice companies that enable a transition toward producing long-lasting products?**

2. Theory

Firstly, in order to understand the approaches to product longevity, we must investigate the potential barriers that can hinder the production of long-lasting products. In line with Jensen et al. [3], we adopt a framework suggesting that there are three main

stakeholders influencing the longevity of products. The first is the consumers, through purchase decisions and use. The second is product development, namely, designers and engineers. The third is businesses, through marketing and sales. Through their extensive review, they have addressed 14 barriers that can hinder product longevity (Figure 1):

Barriers for long-lasting products		
Business barriers	Product development barriers	Usage barriers
Barrier 1: High cost of changing business model	Barrier 6: Inability to follow fast-moving trends and fashions	Barrier 10: Short lifecycles promoted by retailers affects user behaviour
Barrier 2: Customer rejection of change in business model	Barrier 7: Technological innovation makes long-lasting products obsolete	Barrier 11: Lack of attachment to products
Barrier 3: High price points of long-lasting products	Barrier 8: Change in societal behaviour makes long-lasting products obsolete	Barrier 12: Customers are partly unaware of material quality
Barrier 4: Vulnerability regarding short, fixed leasing periods	Barrier 9: Lack of focus on longevity in innovation	Barrier 13: Evaluating longevity in a purchase situation
Barrier 5: Time-consuming alteration of customer perception of product and brand		Barrier 14: Misperception of modularity in advanced products

Figure 1. Overview of Jensen, Laursen and Haase's [3] barriers to product longevity.

The barriers form a foundation, based on which this article focuses on the decisions companies' make to improve and maintain the longevity of their products. To investigate companies' decisions about promoting product longevity, a common understanding of the incremental transformation process and its limitations must first be established. In line with Müller and Pfleger's [18] suggestion that sustainable transformations can be perceived as three-dimensional, we propose a similar view of product longevity as measurable across three parameters.

Müller and Pfleger's [18] original model (see Figure 2) suggested that the three dimensions of the sustainability maturity cube were corporate activities, sustainability and sustainability maturity levels. The sustainability maturity cube is used in this article as a positioning device. The selection of this model as a positioning tool is chosen as it presented the broadest perspective of company transformation. The model considers many aspects of the company, including inbound and outbound logistics, marketing and sales, transformative operations, service, procurement, infrastructure, human resources and technology development. This qualifies the model as a tool that considers as many perspectives and consequences when engaging in sustainable transformation.

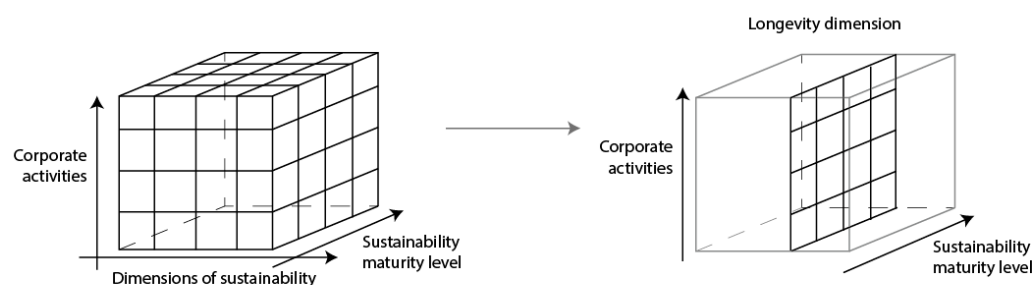


Figure 2. Müller and Pfleger's [18] 'Sustainability Maturity Cube' and model interpretation.

Regarding the sustainability maturity cube, Müller and Pfleger [18] propose the first parameter to be the dimensions of sustainability, namely, environmental, social and economic sustainability. These describe various aims of sustainability, and we argue that longevity can be perceived as a subcategory of environmental sustainability, thereby enabling a section view of the sustainability maturity cube. To investigate corporate activities and sustainability maturity levels, we now consider this section view.

The corporate activities describe what decisions and activities companies execute to improve the longevity of their products. Such activities aimed at extending prod-

uct longevity have been widely described in the literature [16]. Researchers argue that businesses and business model innovation significantly influence decisions about producing high-longevity [2] products and that changes to business models themselves are top management activities. Business model innovations that support or even benefit from high-longevity products—such as Product service systems—usually encourage companies to produce high-longevity products because longer-lasting products minimise repair and replacement expenses for the companies that sell them. Product service systems that support longevity have been widely explored in the previous literature, where renting, leasing and takeback systems have been highlighted as business models that encourage increased longevity for products [19]. The definition we use for this aspect of business-model innovation is derived from Geissdoerfer et al. [20]: ‘the conceptualisation and implementation of new business models that can comprise the development of entirely new business models, the diversification into additional business models, the acquisition of new business models, or the transformation from one business model to another’.

The second parameter of product longevity is sustainable maturity levels. Some longevity approaches are more easily implemented than others and, similarly, some are more approachable. Companies’ abilities to engage and implement these approaches depends on their maturity regarding the subject. The literature has pinpointed many relevant stakeholders within such approaches to product longevity while also highlighting the complexity of this transformation [16]. These stakeholders include businesses, users and product developers. Business approaches include all options for management, marketing and sales professionals. Marketing influences customers’ perceptions of products, product groups and companies. Thus, marketing can support, maintain and change customers’ perception of brands or products, indirectly affecting the chances of achieving longer product longevity [21–25]. Meanwhile, product development activities include the available approaches for designers and engineers at a company. Product design and the development of aesthetically pleasing products can counter ever-changing fashion and trends. For instance, more durable materials can be chosen that age in more aesthetically pleasing manners [26], and sturdier construction can be implemented. Products can also, for example, promote longevity by being specifically designed as modular or easily repairable [27]. The ability to exchange product parts can enable consumers to maintain products and extend their longevity. However, many products are discarded before they break, so durability is not the sole influence on product longevity. If customers do not perceive products as valuable (monetarily, sentimentally or both), they are likely to discard these products prematurely [28]. Therefore, customers’ relationships with products—entailing, for example, memories, pleasure and aesthetic appreciation—also influence product longevity [29]. Finally, users and consumers are stakeholders in approaches to longevity. Currently, society seldom encourages the proper maintenance and repair of products after they are purchased. Low product prices increase the likelihood of substitution rather than repair [12,30,31], and many modern families are unqualified to maintain even simple products [32–34], which is reflected in increased consumption [29,35]. However, consumers play a major role in determining product longevity.

A company’s ability to engage and control its stakeholders, as well as influence the lifetimes of their products, is therefore an expression of their maturity in this area.

3. Materials and Methods

To research the decision-making processes and tactical approaches of managers in best-case companies, we apply an inductive method because the topic has received limited attention in the current literature.

3.1. Data Collection

Based on the methodology of inductive research employed by Goia et al. [36], the current study collected data through semi-structured interviews with the employees of best-practice companies. At each of the 18 participating companies, with the help of an

interview guide, we conducted qualitative, semi-structured, open-ended interviews with 1 to 3 participants. The interview guide was supplemented with additional questions that were based on a thorough background check of each company, ensuring that the interview questions were as contextualised as possible. Some interviews were conducted with several participants, and other interviews were individual, reflecting interviewees' preferences. Before the interviews, interviewees were asked to name a single exemplary product in their company's portfolio. These responses made the interview conversations more precise and materially focused but still allowed for references to other products.

The interview guide centred on four topics: business (e.g., 'What do you experience as the greatest challenge or barrier when it comes to running a business based on long-lasting products?'), development (e.g., 'In what ways would you say that your products are "designed to last"?'), consumers (e.g., 'What do you experience as the greatest challenge or barrier with respect to the customer or user of a long-lasting product?') and future ambitions. Following Goia et al.'s [36] explorative approach, the interview guide was not systematic but, rather, a list of topics addressing different perspectives on product longevity. This strategy allowed for more relaxed conversations, with spontaneous questions that permitted participants to elaborate on their answers and stories.

Data were collected through interviews with key decision-makers from 18 physical-product-producing companies. Company selection was based on companies' efforts to increase product longevity and our assumption that the approaches they undertook could be applied across product categories. Some companies participate in markets in which high product longevity is expected, whereas other companies have historically proven to produce long-lasting products. Companies with profiles suggesting that they were engaged with the subject of product longevity were included.

To broaden the study as much as possible and ensure variety, we selected companies of various sizes and ages that produce products in various categories. Moreover, the companies we chose had different markets, portfolios and pricing structures. A few of the companies were relatively new but focused on delivering products with high longevity. Lastly, the participants chosen for this study were selected because they were key decision makers at the companies (see Table 1).

Our approach resulted in a collection of physical-product-producing B2B and B2C companies situated in Germany, the United Kingdom and Denmark because we set out to understand the general approaches across these segments. This differentiation allowed our data to reflect a more elaborate and realistic variety of approaches across companies.

The following companies, in random order, participated in this research: Miele, Vola, Danfoss, Bang & Olufsen, Vitsoe, Skagerak Denmark, Hydrema, Takt, Rosti, Porsche Automotive, Marcus Pedersen, Toni, Butchers & Bicycles, Demant, Fredericia Furniture, Monstrum, Morsø Jernstøberi and Nilfisk.

3.2. Data Analysis

Data were analysed concurrently with the interviews, allowing a grounded-theory approach to all 20 interviews. Using the analysis programme ATLAS.ti, the interviews were coded with a basic open coding technique [37] reflecting product longevity.

This analysis, therefore, combined breaking the data down into discrete parts, comparing the parts for similarities and differences and categorising the parts. Some key codes from this process were 'personal vanity towards result', 'business transparency', 'long development times', 'brand nurturing through design', 'selling professionalism' and 'personal pride reflected in products'. These codes were then structured using Gioia et al.'s [36] data structure model (see Figure 3) to distil the codes and thus analyse and identify a more coherent interpretation. Grouping the codes into themes allowed us to compare codes across interviews and identify similarities and differences. Further clustering revealed an emergent pattern: Several approaches to product longevity had been expressed throughout the interviews. To further distil the data, the same system was applied visually to our analysis (see, for example, Table 2).

Table 1. Participating best-practice companies and employees: The letters listed twice (e.g., for interviews 15 and 16, Company O) refer to two individual interviews with different participants from a single company, whereas interviews with multiple participants are listed as a single instance of a letter (e.g., Interview 2, Company B).

Interview #	Company	# of Participants	Employment Position	Duration
1	A	1	Owner and CEO	1:44:13
2	B	2	CEO Lead industrial designer	1:22:35
3	C	2	CEO and founder Design director	1:03:45
4	D	1	CEO and co-founder	1:15:39
5	E	1	CEO	1:56:46
6	F	2	Owner and CEO Senior designer	1:56:55
7	G	3	CEO Sales and marketing director Head of design/MA	2:04:31
8	H	2	VP R&D Director of portfolio management	2:07:15
9	I	1	Global product manager	1:27:20
10	J	1	R&D manager	1:31:09
11	K	2	CEO Creative director	1:18:17
12	L	1	Head of hardware development	1:14:02
13	M	2	Brand manager Purchasing manager	2:00:51
14	N	1	Director, product quality management	1:45:46
15	O	1	Director	0:57:55
16	O	1	Manager advanced design	0:43:59
17	P	1	Vice president and head of innovation	1:37:20
18	Q	2	Owner Head of design and product management*	1:48:04
19	R	1	Vice president of design	1:03:19
20	R	1	Executive director	1:12:03

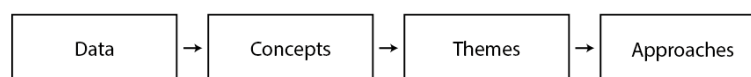


Figure 3. Goia et al.'s [36] model of data structure.

Then, to reveal further patterns among the identified approaches, we shifted our coding techniques. With an offset from a review of the literature on barriers to product longevity [3], which has rigorously explored a wide variety of areas in the product longevity literature, the second part of our data coding was based on how practitioners handled and recognised the 14 barriers to product longevity described in the literature (see Figure 3).

Our data analysis focused on whether participating companies had faced or recognised the barriers described in the literature, as well as how they had managed these challenges. The solutions to the barriers and related principles that the companies presented paralleled our initial data analysis.

Table 2. Example of how the qualitative analysis of the data is conducted following Goia et al.'s [36] model of data structure to find groups of approaches.

Data	Concepts	Themes	Approaches
<i>'Our customers just want to be comfortable, so there's no reason for a wide range of customisation options. If we talk about low maintenance, then you also have to select components that are durable in the use situation' (Company D, 0:21:07).</i>	High performance expectations and demand	Setting extraordinary performance criteria	Performance-driven approaches
<i>'We are very careful not to interfere with these groups, as they provide us with the raw truth about our products. We use this a lot to tweak the product to become even better' (Company F, 1:17:00).</i>	Observing lead-users	Following performance-Lead users	

4. Analysis

As exemplified in the theory section, the coding the interviews with representatives of best-practice companies revealed three groups of approaches to product longevity in terms of their tactical decisions. Across widely divergent product categories, the approaches to product longevity shared multiple similarities, as the interviews revealed. Our findings could therefore be categorised into three groups of approaches to product longevity, as defined by participating companies' thought patterns: *performance-driven*, *behavioural-change-driven* and *vision-driven*.

4.1. Performance-Driven Approaches

Based on the interviews, the most salient approaches to product longevity concerned product performance. Striving for the best performance typically results in the use of better materials, more durable construction and increased sturdiness, reparability and modularity (all of which potentially prolong products' physical longevity). For customers, these qualities are the easiest improvements to longevity to recognise because many (but not all) are visually or tangibly obvious in purchasing situations. Differentiation from other brands through performance (e.g., with 'high-quality' designs or materials, such as solid wood instead of laminate or steel plate instead of plastic shells) can yield better customer impressions of product durability during purchasing situations. Similarly, customers often appreciate choosing a sturdy technical product build over time because such products exceed initial expectations.

4.1.1. Setting Extraordinary Performance Criteria

These companies set extraordinary performance criteria for their products and portfolios (e.g., being the most durable, fastest, clearest or strongest in the market). Products that deliver extraordinary performance and simultaneously differentiate themselves aesthetically from other products give customers satisfactory experiences and emotional fulfilment regarding their purchases. These effects stimulate attachment to and satisfaction with a product and, thereby, increase the likelihood that a consumer will keep the product longer:

'Our customers just want to be comfortable, so there's no reason for a wide range of customisation options. If we talk about low maintenance, then you also have to select components that are durable in the use situation' (Company D, 0:21:07).

'I set up two criteria when we develop. The first is that it's not allowed to look like anything else in the market [. . .]. Secondly, it must perform extremely well. Naturally, there are also some underlying criteria to price points, etc.' (Company F, 0:34:30).

4.1.2. Following Performance-Lead Users

For these companies, uniqueness and extraordinary performance differentiation have created unique situations. Independently, user communities centred around the use of the product have formed. These communities discuss, enhance and customise their products and share knowledge and experiences, often in online forums. These communities, therefore, form independent user bases that companies observe and cater to, thus ensuring extraordinary performance and longevity in the future. This relationship is described by the companies as synergetic because these customers benefit from product improvements while the companies strengthen the products' dissemination and gain large quantities of data and testing results with which to improve products:

'We are very careful not to interfere with these groups, as they provide us with the raw truth about our products. We use this a lot to tweak the product to become even better' (Company F, 1:17:00).

'We see changes in our community at the moment. Some patterns in regards to our community and market indicate that they want to buy fewer products, be conscious of how they spend their money but also to expect better and more durable ones. We see that as an opportunity' (Company I, 0:20:00).

4.1.3. Implementing Performance Values from Previous Products

Participating companies closely compared their new products to older successful products. By considering the performance of previous products in their own portfolios, these companies were able to accumulate knowledge and experiences from previous designs to implement in the new products. These companies expressed that this 'knowledge bank' set them apart from competitors and that these insights ranged broadly from aesthetic details to overall process control. This approach applied to several companies, which were extremely aware of comparisons between older and newer products:

'We need to design our future products to deliver on design, material and functionality' (Company M, 0:38:00).

'When we continue evaluating our product, we develop a set of requirements that we are bound to fulfil. This setup is our key to using the knowledge that we have to keep developing strong products. [. . .] The requirements are the same for all our products and have been developed and updated over time' (Company N, 0:27:19).

4.1.4. Accepting Long Development Processes

These companies used extraordinarily long development times to support the development of their best-performing products. Using this extended development time, these companies were able to deliver products that outperformed their competitors' alternatives. To do so, the companies often had to accept not being first movers in their markets; however, they launched products with extraordinary performance. This extended development time enabled products that were 'future-proof' and, therefore, had higher longevity. Similarly, the products were less prone to trends and fashions and, therefore, premature substitution—due both to their later market launches and more tailored experiences but also as a consequence of higher sales prices:

'The simplest product possible [. . .] thought through, but not exaggerated in any way' (Company H, 0:54:00).

'You can create products that can sell now, or you can create products that are future-proof for next sales. Even if the customer has new demands, the product still delivers' (Company B, 1:18:49).

4.2. Behavioural-Change-Driven Approaches

The findings from the interviews show that behavioural-change-driven approaches focus on how companies can change either their behaviour or their current or potential

customers so as to increase their products' longevity in the market and, in some cases, encourage more sustainable production and consumption patterns. One example of a behavioural change is the selection of a business model that supports greater product longevity. This behaviour engages with consumers to support product longevity and potentially improve customers' perceptions of the company as a responsible seller. The behavioural change approach can also comprise company initiatives likely to increase customers' attachment to products, increasing their likelihood of better caring for these products. Both companies and customers actively change via such support initiatives, potentially prolonging purchased products' longevities and expectations for similar products.

4.2.1. Transparent Production

Being open and displaying how products are produced increased customers' trust and strengthened participating companies' brands. One approach used to provide more authentic service was increasing customers' accessibility and familiarity with brands. Brand trust and recognisability increased if customers were familiar with the company, increasing brand awareness. One participating company used this approach by moving their production directly into their physical showrooms, mimicking the experience of an open-kitchen restaurant. Selling became an experience, rather than the mere selling of products, engaging customers and highlighting the company's values and products:

'We want to be completely naked. You can see your product being assembled, etc. It's almost a family feeling, that if you're one of our customers, then you're allowed to be part of the process' (Company K, (0:13:00)).

'You can compare it to a restaurant with an open kitchen. You can see it all, the right raw ingredients and the cooking. When you are served your dinner, you have been on the full journey' (Company K, 0:14:00).

4.2.2. Local Presence and After-Sale Services

These companies were committed, through service agreements, to delivering high-longevity products. In some situations, customers expected and demanded continuous service after purchases, requiring a local presence on the part of the service provider. This local presence and service agreement is likely costly for companies; however, to minimise expenses, companies are encouraged to produce high-longevity products. More durable, longer-lifetime products require less service, thereby simultaneously lowering repair and substitution expenses and improving customers' perceived product experience. While this approach commits companies to strict service agreements, it also creates strong market advantages in their geographical locations:

'We have decided that service is a business opportunity for us. We have to be present in the market where we sell' (Company J, 0:21:00).

4.2.3. Evolving Existing Products

These companies consciously kept their portfolios limited and instead iterated existing products and designs, even after market launches. Limiting the number of products in portfolios enabled companies to limit spare part stocks, thereby increasing their products' reparability. Their limited number of products—all preserved in their portfolios—were, however, in constant development. This approach is only possible with a limited portfolio because a broad portfolio with seasonal product changes would counteract this goal. The company, therefore, accumulated specific knowledge of its exact products, maintaining a market advantage and an evolved product that became the best on the market:

'In nature, there are no new species. Species evolve, and it's a constant sequence of small changes. So, this whole notion that humans have come up with, that every year we have to go to a trade exhibition to see all this new stuff, that's absolute rubbish! We, as a society, have come to value new, rather than better. Yet, as an industrial designer yourself,

you know that the most difficult challenge is to make something better. [. . .] That's what nature does, and we, as an economic society, are a wholly owned subsidiary of nature' (Company P, 0:25:42).

'We haven't launched a new series in 15 years. It seems like almost the same product today as 15 years ago, but naturally with upgrades' (Company L, 0:19:48).

4.2.4. Long-Lasting Aesthetics

These participating companies were very cautious about the design language they saw as representing their identities. This language had to be unique, reflect their identity and apply to all their products. When designing new products, companies can mimic the aesthetics of older, successful, long-lasting products. Visually familiar products are associated with one another, as are their values and impressions, so customers also expect new products to be high quality and long lasting. One company, for example, expressed a desire to measure all new product suggestions against prior designs in order to mimic previous aesthetics:

'Before we even think about drawing anything, we need to find out what the DNA is. This was the first time in a long time the company wanted to introduce a new series of products, [. . .] so it was very important that we continued to follow this DNA and that this, too, became a classic product. This was an ultimate requirement' (Company G, 0:07:23).

'The difference between being modern and being fashionable [. . .]. Even when we make products that are supposed to be as modern as possible, we still try to keep away from fashionable design items and design languages. This is sometimes quite hard to distinguish, what is what' (Company O, 0:03:58).

4.2.5. Limiting Seasonal Trends

The participating companies that were in markets highly influenced by fashion only considered fashion in their products' interchangeable parts. Products designed for fast-moving fashion are prone to substitution before they wear out, conflicting with longevity. One company aimed to design products based not on fashion but on sustained market relevance. However, select product elements that were easily substituted were allowed to reflect fashion-driven design. The elements affected by changing trends were obviously substitutable, only influencing single parts' longevity rather than that of the entire product. The ability to cater to fashion-focused consumers positions companies in a unique market with a larger potential buyer group while maintaining product longevity:

'We know that we've made a fashion element here, but we can also see a demand for this. So, if we're pursuing these fashion elements, it must be on these selected parts' (Company A, 1:02:27).

'We try to make many of the visible parts of the products modular. If people move, some want to change the aesthetic of our product to match their new home. By changing the "shell", they're able to do so without exchanging the entire product' (Company I, 0:45:30).

4.2.6. User Involvement in Assembly

Participating companies actively used customers' first engagement with their products to facilitate great experiences. These experiences improved customer satisfaction and product-user relations, countering premature product substitution. Engaging customers in the assembly process can generate feelings of personal accomplishment, increase customer satisfaction and present a product's hidden details. Customers with good assembly experiences will remember these experiences when looking at a product. These pleasant memories will likely increase attachment and, in turn, the length of time a customer retains a product:

‘Many brands make a great effort at storytelling. You can almost smell the workshop when you buy some products. Maybe you can deliver that experience to the customer in a more realistic way so that it doesn’t come through the ears and eyes but the hands and body. You get that from assembling your product. [. . .] I might even become happier with the chair’ (Company C, 0:09:39).

4.3. Vision-Driven Approaches

Patterns from the interviews show that vision-driven approaches are ideas that companies implement throughout all departments. All company decisions are affected by this vision as a paradigm reminding employees of a common goal. Participating companies’ visions differed and were phrased variously, often emerging from a single visionary at a company. The vision-driven approaches seldom referred directly to products in the company’s usual category. Instead, they seemed undefined and universally applicable. However, some products that companies recognise as fulfilling their vision remain prized possessions among consumers due to high attachment, even after these products break down. A combination of a more specified business, design and customer management enables companies to establish and fulfil their visions.

4.3.1. Solving Long-Lasting Problems

One company expressed its vision as the pursuit of ‘long-lasting problems’. If a product solves a long-lasting problem, then it will likely remain relevant in the market longer. Producing products that remain relevant enables producers to invest more time in development because the continuous sale of a product permits higher initial investments. The long-lasting problems presented by the company were more abstract than the initial product category, allowing for more creative solutions. The company defined long-lasting problems as universally agreeable and basic to humans (e.g., couples’ difficulty agreeing on interior design). Although long-lasting problems may seem vague and undefinable from an outside perspective, they constitute a foundation upon which companies can build requirements and sub-problematics, thus directing design. Long-lasting problems, therefore, guide the design and decision-making processes toward solutions to surrounding problems that may not be immediately apparent by adding new elements, aesthetics or features that add to a product’s uniqueness and longevity:

‘You have to make absolutely sure that you’re solving the right problem. [. . .] and the problem that you are trying to solve needs to have a certain relevance and longevity. That’s also how we differentiate from the archetype of how things are supposed to look’ (Company I, 0:42:22).

4.3.2. Longevity through Collective Attachment

One company enabled the production of high-longevity products by designing for collective—rather than only personal—attachment. Stimulating collective attachment means that products are often better maintained, repaired and used because users not only appreciate their functionality but also their underlying personal values, such as pride or affiliation. This approach combines focusing on the products’ artistic and aesthetic values with an understanding of customers’ identities. It requires the production of custom-made solutions unique to an individual community. Products that represented their locations encouraged strong affection from users:

‘Right now, we exist in a niche market, where we’re quite different from our competitors, [with] specially designed products with no standard assortment, and this is the only thing you see when you visit our website’ (Company F, 0:09:00).

‘No standard production means that we’re more directed to the customers and that we become increasingly good at producing specially designed things that can match the other companies in price, with high-quality materials. Strike a balance between longevity, design and everything so that it just works’ (Company F, 0:09:58).

'If we can create something that gives identity to an area, then it's especially meaningful' (Company F, 0:55:44).

'We always worked with what we called 'domestic design', designing things that appeal to the entire household and everyone living in it' (Company I, 0:48:00).

4.3.3. Confidence in a Product Portfolio

These companies expressed exceptionally high confidence in their product portfolios. The producers of high-longevity products have had previous experiences of confidence in their products that had sold poorly early in their launch but later attracted attention. By continuing this confidence in new products, many that at first seemed lacking became classic designs and sources of pride. The rapid discontinuation of a certain product likely leads to the product being forgotten by customers, implying a lack of confidence in the product. Therefore, if a product remains available for decades, it can gain more recognisability and show proof of concept. This effect increases the chance of creating a 'classic', signalling future relevance:

'If we had discontinued our production of the [product], it would not have become iconic, because it needs to be nurtured. You have to be brave enough to stick to one idea' (Company O, 0:20:18).

'It is, at its core, about running a business. Products that last are also about a well-managed business and that you keep showing the products and believe in them [. . .]. If you believe in the product, you have to give it time to find its place in the market' (Company Q, 0:26:09).

'Everybody wants to do something iconic. There's one big issue. An icon isn't created. An icon is grown over decades. When we talk about making something iconic, it's not only about shape. It definitely helps when you have a distinctive shape, and I think, as well, there's pragmatics involved. Is it well designed?' (Company O, 0:17:16).

4.3.4. Longevity as a Quality Parameter

The participating companies perceived longevity as a quality parameter. Increasing longevity was understood as part of a vision to create quality products. The vision of quality was expressed differently for each product and product group, and longevity was always a parameter to consider alongside other parameters, such as convenience:

'Our customers are very experienced. They've already owned a lot of stuff. They know about the energy you need to substitute products. When you're busy, there's no energy left for this decision. [. . .] Therefore, it's much better to have something better, durable, working and that doesn't add complexity to my life. This is an important success factor' (Company R, 0:15:12).

5. Concluding Discussion

Through interviews and an extensive multiple-case study of 18 best-practice companies producing a wide variety of products, we catalogued several business and development approaches that elucidate the concept of *longevity*. These approaches shared similarities and were divided into three major categories: *performance-driven*, *behavioural-change-driven* and *vision-driven approaches* (see Figure 4).

Performance Driven Approach to product longevity	Behaviour Change Driven Approach to product longevity	Vision Driven Approach to product longevity
The performance-driven approaches to product longevity focuses on how to achieve the ultimate performance of a product. Often seen as physical improvement like technical or aesthetical changes, but also digital, interaction and general product performance aspects.	The behaviour change-driven approaches concentrate on how a service or behaviour changing can support longevity in a company. This behaviour change can both be a change in the company behaviour and/or in the customer behaviour to support the longevity of a product.	The vision-driven approaches are controlled by a company vision, often by passionate visionaries in the company. The visions can often seem abstract and undefined at first glance; however, create a clear direction and vision goal and striving for longevity in everything they do.

Figure 4. The three types of approaches to product longevity expressed by participants.

While the existing literature has mainly focused on product performance (e.g., [26,38]), this study investigates performance-driven approaches. Likewise, while the previous literature has investigated the implications for customer behaviour and purchase patterns (e.g., [29,39]), this study has investigated behaviour-changing approaches in companies. Lastly, we see that, in the existing literature, there has been a focus on the value proposition for product longevity (e.g., [40,41]) for companies; however, this paper investigates the vision-driven approaches that enable this. Through a rigorous analysis of our dataset, we provide the foundation for a more materially orientated approach to product longevity. The research conducted in this article, therefore, contributes to both design and business science with a framework of a perspective towards longevity. The perspective of practical approaches creates a basis for further exploration into both the business motivation for engaging with product longevity, as well as the design motivation for focusing on the subject.

Finally, this study's findings indicate that, despite engagement with different product categories, similar approaches are applied across product categories, forming the baseline for companies' views on product longevity. This knowledge can be used to develop more practical strategies to improve product longevity and encourage further research across product categories.

While this study was not prepared to examine the differences between B2B and B2C companies, this could be an interesting subject to explore. However, our study shows indications that there is a coherence between B2B and B2C companies in their approaches, even though B2B companies often provide longer warranties and other guaranties.

5.1. Reflection on Hierarchy of Approaches

Among the three groups of identified approaches to product longevity, namely, performance-driven, behavioural-change-driven and vision-driven approaches, we observed a hierarchy related to maturity (see Figure 5). To successfully produce long-lasting products, companies must first employ performance-driven approaches in their tactical thinking. The physical experiences of a product and the product–user interaction constitute the baseline for a product's longevity. Companies that employ vision-, service- or behaviour-driven approaches without experience with performance-driven approaches are likely to experience difficulties because physical longevity must live up to customers' expectations. Performance-driven approaches are also the most tangible because they primarily concern the material selection, patina, durability and performance. Companies committed to delivering high-longevity products can then develop and implement behavioural-change-driven approaches in their tactical decisions to support their products. Supporting an already durable product with service extends its potential longevity even further (e.g., authorised service and maintenance in the car industry prolongs cars' lifespans and signals that companies still vouch for their products even after they are purchased).

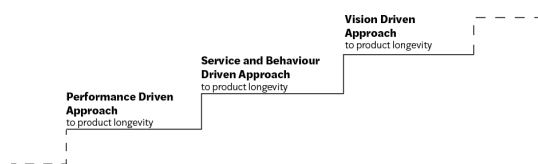


Figure 5. Proposition of a sequence of approaches to longevity.

The companies that employed more abstract approaches to longevity also seemed to have previously employed more physical approaches. However, over time, as more tangible and physical approaches were incorporated into their businesses, they could concentrate on more abstract approaches. At this point, the physical approaches became routine. The transition to producing long-lasting products, however, still seems gradual. Nonetheless, we observed a slow evolution in this process towards the total implementation of approaches and a need for companies to improve already implemented approaches.

5.2. Limitations of the Study

The companies selected for this study are mainly producers of physical products; therefore, they do not include producers who solely produce digital services, digital products or software.

Furthermore, this study is limited to certain physical product categories and has therefore excluded producers who mainly produce clothing and textiles, packaging and rapidly consumed consumer goods, such as food.

Another limitation of this study is that the main business model of many of the best-case companies examined in this research centres around a conventional supply chain logic. This is designed to create coherence among the participants and eliminate unknown factors (e.g., hidden profit streams) that could influence the motivation to produce products with high longevity.

The study is limited to interviews with leaders or design leads (key decision makers). It is possible that insights from employees, on an operational level, would result in other perspectives and perceptions.

While this study was not focused on product obsolescence or product service systems, we believe the results may be relevant in these domains and, therefore, consider this an interesting avenue for further research.

A further limitation of studying best-case companies is that top management is already motivated to implement transformation and investing in this. Investigating companies in which top management has not engaged with the subject could prove interesting with regard to the transformative steps toward higher longevity.

Regarding practical implications, this study provides an overview of three approaches to product longevity that applies to companies at different levels of maturity. This means that none of the approaches can be regarded as superior to any other. Rather, this study suggests that different companies must engage with different approaches depending on their current maturity and situation. It also suggests that longevity parallels a continuous maturation process.

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