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RESEARCH ARTICLE

Tangible Design Histories: Constructing Historical Knowledge through Vacuum Cleaner Product Lineage

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ABSTRACT:

This paper examines a thirty-year collection of Dyson upright vacuum cleaners as a tangible archive and considers how designed objects contribute to the construction of historical knowledge. Eighteen UK vacuum cleaner models spanning 1993 to 2023 were examined through photographic documentation and comparative object analysis. A focused comparison was undertaken between a post-consumer DC01 and an unused DC01 held by the Museum of Design in Plastics (MoDiP), followed by teardown of the post-consumer example. Patent material associated with the development of the Dyson Ball was also examined alongside the commercialized product lineage. The physical lineage records continuity and change across successive products, while the patents provide a partial documentary record of design development. Comparison of the two DC01s shows how substantially the same design can acquire different material histories through preservation, use, repair and ageing. These different trajectories preserve different forms of historical evidence. Across the wider lineage, successive product development also overlaps with the continuing lives of earlier objects, producing a more complex temporal history than a sequence of product introductions alone. The paper argues that bringing separately surviving objects into comparison as a tangible archive creates relationships that are not available through individual objects, museum collections or documentary sources alone. Examined as a collection, the product lineage allows changes across successive designs to be distinguished from changes accumulated by individual machines, the tangible archive collection records both the development of the Dyson upright and the subsequent lives through which its designs became available as historical evidence.

Keywords: Tangible Archives; Design History; Product Families; Object-Based Research

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Introduction

Museums are full of examples of successful and iconic design [1]. Products such as vacuum cleaners can help tell many different stories from social mobility and gender roles through to material technology and product innovation [2]. These curated museum narratives of design rely on heritage objects in carefully conserved collections [3]. Conservation protocols are in place to manage and preserve museum objects, however this can also limit the ability to explore material, functional and experiential aspects of design objects [4].

This study explores a collection of 18 Dyson upright vacuum cleaners as a tangible archive. By assessing the materiality of these lived objects, the collection complements conventional museum practice and offers tangible insights into design history that help strengthen and expand existing design research theories.

Design history has traditionally approached objects through the circumstances of their conception, manufacture, and initial reception. Analytical emphasis has frequently been placed on the designer, the industrial context of production, and the formal characteristics through which artefacts enter the market. This orientation has been central to the development of the discipline, allowing historians to reconstruct the institutionalization of design practice, the relationships between designers and industry, and the evolution of industrial form [5, 6, 7].

Yet this emphasis has also shaped the kinds of objects that most often function as historical sources. Design historical research frequently relies on artefacts preserved in conditions that approximate their original configuration, whether encountered in museum collections, corporate archives, or design documentation. These preserved objects provide crucial evidence of design intent, manufacturing processes, and technological innovation. However, they tend to represent a specific moment in the life of the artefact: the stage at which it emerges as a finished product within industrial production.

Once objects enter everyday circulation, they become subject to processes that are less visible within these conventional sources. Use, maintenance, repair, component replacement, and environmental exposure gradually alter their material condition. These processes produce traces (surface abrasion, degraded materials, service markings, and improvised repairs) that act like witnesses of how designed objects persist through everyday use. Such traces constitute a layer of historical evidence that remains comparatively marginal within design historical analysis.

1. Design Objects as Historical Evidence

Within the discipline, the role of objects as historical sources has long been acknowledged. Early methodological discussions emphasized the interpretive value of artefacts themselves, encouraging historians to analyze their material composition, form, and construction as evidence of design decisions and industrial production [8]. Subsequent scholarship broadened the scope of design history by situating design within wider social and cultural contexts, examining patterns of consumption, everyday practices, and the circulation of goods within modern societies [6, 7].

Parallel developments in material culture studies further expanded the interpretive potential of objects. Scholars working in this field have argued that artefacts should be understood not only as products of design and manufacture but also as participants in social processes that unfold through use and reinterpretation. In these approaches, objects generate historical knowledge not only through their formal properties but also through the meanings and practices associated with their circulation in everyday environments [9, 10].

Despite these developments, the methodological implications of such perspectives have only been partially integrated into design historical practice. The objects most frequently examined by design historians remain those preserved in institutional collections or documented through design archives. As a result, the stages of an object's life that occur after its introduction into everyday use remain less systematically examined.

Design history has also moved beyond accounts centered primarily on designers, manufacturers and stylistic development towards wider analyses of production, consumption, mediation and everyday life [11, 12, 13]. This broadening of the discipline changes the kinds of evidence that can be considered historically significant. An object can provide evidence of its original design and manufacture, but it may also retain material traces produced through later use, maintenance, repair and ageing.

How such evidence survives is important. Archives and collections are shaped by processes of selection, classification, preservation and description, which influence what remains available for later historical research [14]. Trouillot draws attention to the stages through which historical sources are produced and given significance [15]. Applied to design objects, this means that a museum object and a post-consumer object may survive for very different reasons. One may have been deliberately accessioned and conserved, while another may remain because it continued to be useful, was repaired, resold, stored or retained for parts.

Material traces also require interpretation. Ginzburg's discussion of historical evidence emphasizes the importance of apparently minor traces that can support inference when considered in context [16]. Prown similarly established the value of material objects as primary evidence [8], while Appadurai and Kopytoff show how objects acquire changing meanings and conditions as they move through different social situations [9, 10]. Scratches, replacement parts, degraded seals, service labels or accumulated residues do not explain an object's history by themselves. Their value comes from comparison with other evidence, knowledge of the object and the questions being asked of it.

Product lineages add another temporal dimension. Changes between successive models can provide evidence of how a design develops across generations [17, 18], while individual surviving objects retain material evidence of what happened after manufacture through use, repair and ageing [8, 9, 10]. Earlier products may also remain in use while later generations are introduced. This is consistent with Edgerton's critique of histories organized mainly around innovation [19], which directs attention towards technologies in use and their continued existence after the moment of introduction.

These perspectives provide the theoretical basis for the tangible archive examined in this study. They suggest that designed objects continue to acquire historical evidence after manufacture throughout their lifetimes. At the same time, the conditions under which objects survive affect what evidence remains available: museum conservation preserves some aspects of an object, while continued use and repair preserve or create others.

Different kinds of surviving objects can therefore answer different historical questions. In this study, the MoDiP DC01 provides evidence of the product in a preserved condition, the post-consumer objects retain traces of use and intervention, and the thirty-year product

lineage provides evidence of change between successive designs. Bringing these sources into comparison allows the study to examine both the development of the Dyson upright and the different material histories accumulated by individual products after manufacture.

1.1. Heritage Products in Design Research

Modern consumer products often have relatively short, planned lifetimes of around five years. Products exist within wider industrial, social and material contexts and are shaped by changing technologies and manufacturing practices [7]. Products rarely exist in isolation [18], and placing a series of products in the context of its lineage [17] allows changes in design to be examined across time. This approach makes it possible to explore both technical and societal changes, for example changes to product specifications demonstrate advances in materials and manufacturing technology. By mapping products across time broader societal changes can be evidenced [20, 21].

Design history and the study of tangible objects provide critical forms of design research discourse. Heritage collections offer an important record of design history through the curation of physical objects, yet the design development, manufacturing innovation and lived history of iconic designs cannot be fully explored through static, untouched museum examples alone [20, 22]. Tangible, post-consumer objects contribute alternative insights by revealing material change, wear and repair, which written and curated narratives may obscure [21]. Teasley [23, pp. 18] places artefact analysis within contemporary design history and argues for closer exchange with design research.

For plastics in particular, the challenges of degradation are well documented within museum and conservation discourse [24]. This deterioration translates to products in society whether still in use long after their planned lifetime or as materials that are being recycled.

This study contributes to design history by showing how post-consumer products can function as sources of design knowledge, complementing perspectives offered by museum collections. Drawing on object-based design research and material-culture approaches, the paper positions tangible archives as a way of accessing the lived material histories of products, moving beyond designer-led or purely textual accounts [7, 8, 25]. By framing the Dyson uprights as a 30 year material record, the study expands existing design research methods and demonstrates how material evidence can support the study of design evolution across time [6].

1.2. Materiality

Materiality plays an important role in design theory because objects support different forms of understanding. Museum and material-culture studies show that physical objects carry meanings shaped by their use, condition and context, not just by their intended function [22]. Encounters with physical objects provide opportunities to see wear, ageing and repair, offering tangible insights that written accounts cannot provide [20]. At the same time, museum practices often prioritize preservation and stable examples, which can limit engagement with material change over time [24]. Collections shape how design histories are constructed by determining what is collected and how it is interpreted [26]. Together,

these perspectives position material objects as an important part of design research discourse.

Material culture scholarship provides conceptual frameworks for analyzing objects across their entire trajectory. One influential approach is the notion of the "social life" or "biography" of things, which emphasizes the ways objects move through successive phases of production, exchange, ownership, use, and eventual discard [9, 10]. From this perspective, artefacts are not static entities but participants in ongoing social processes. Their meanings and functions evolve as they circulate through different contexts.

Museum and heritage studies have also drawn attention to the institutional conditions through which objects become historical sources. When artefacts enter museum collections, they are subject to processes of classification, interpretation, conservation, and display that stabilize their material condition and frame them as representatives of particular historical narratives [20, 27]. These practices preserve objects for future study, but they also privilege certain moments in an artefact's life; often those associated with its production or early circulation.

These perspectives suggest that the material conditions in which historians encounter objects are themselves historically significant. Artefacts preserved in museum collections represent one stage in an object's trajectory, often frozen in time, while objects encountered in post-consumer environments preserve evidence of different paths in that trajectory. Examining these different conditions together makes it possible to reconstruct aspects of an object's history that remain invisible within preserved design archives alone.

1.3. Vacuum Cleaner Collections in Design Museums

For some, the placing of a product in a museum is to "end" it [28], put it "beyond the realm of function," [29] or remove it from its intended social context. For others, the object in a museum is not de-contextualized but re-contextualized [20]; it is still in a real setting but is interacted with by humans in a different way from its designed function. Accredited museums are under the obligation of the accreditation scheme [30] to evidence through policies and procedures that they will ensure the objects in their collections are cared for to a high standard and are used appropriately for the current and future audiences. This may mean displays and exhibitions housed behind glass, careful handling occasionally restricted only to curators, and often with gloved hands.

Since the 1990s, museums studies literature has discussed the material value of plastic objects in collections [4, 22], shortly followed by the observation of the degradation of plastic materials [31]. The degradation of various plastics materials cannot be reversed easily through conservation methods but can be slowed down through preventative conservation. This makes it even more important that objects made of plastic materials are handled with care.

1.4. Tangible Archives—Learning from Products

A great deal can be learned about design from products that have lived in everyday settings. Product teardowns are a practical method for understanding how products were originally

designed and manufactured, and for examining the materials, components and assembly decisions involved [32]. Everyday objects also act as tangible archives. When products remain in circulation, they accumulate evidence of lived experience through wear, repair, improvised fixes, replacement parts and material degradation; these traces can reveal how a product was actually handled and maintained over time [8, 25].

Beyond single examples, relationships between products within a lineage add further insight. Looking across several models makes it possible to see how design evolves through incremental changes, platform adaptations and shifts in materials or manufacturing [17, 33, 34]. These patterns can reflect technical developments, but they can also signal wider cultural and social changes [25]. In this way, tangible archives help connect material evidence with both technological development and everyday lived practice.

This study follows the Breakell and Russell theories of archival materiality and explores the assembled Dyson collection as a tangible archive [21], through the objects lifetimes that retain evidence of design and use that can be examined in relation to one another.

2. Methodology

In this study physical products are the primary evidence for design history [23]. The Dyson upright collection was examined through four forms of analysis:

(a) Product family analysis: The physical product lineage examines how an architecture develops across the commercialized product range. Diachronic object analysis retrospectively explores the relationships between models through photographic documentation and notes on form, material and construction features, following comparative object-study approaches [7].

(b) Technological innovation study: Using object-oriented approaches to describe design features and product structure [35] we examine how a technological innovation changes that architecture. Selected patents associated with the development of the Ball were examined alongside the physical samples, providing a partial record of design development that complements the commercialised product lineage.

(c) Museum vs post-consumer product comparison: A curatorial, comparative condition assessment [36] was used to compare the museum example with one from the post-consumer tangible archive. Considering how differences from both objects "lived experiences" may suggest variations in historical evidence.

(d) Post-consumer product Disassembly: Examines what internal construction and condition become visible through teardown. The teardown followed common disassembly methods [32]. Each stage was documented through photographs and notes on materials and wear.

Figure 1 summarizes the study procedure, from defining and assembling the product lineage to interpreting the findings.

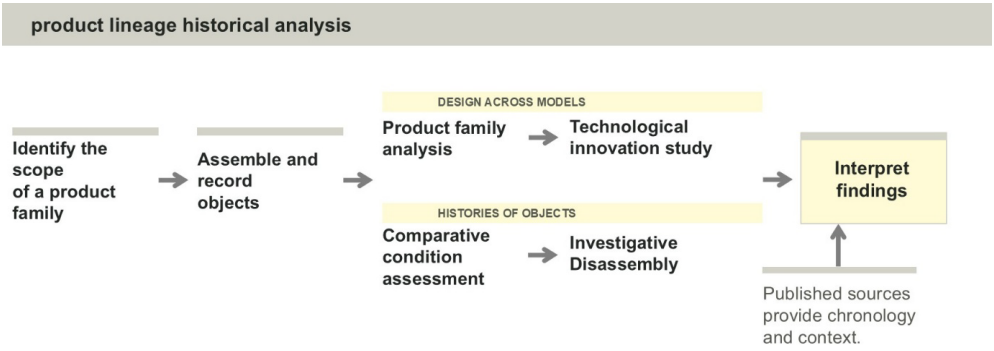


Figure 1. Historical product lineage methodology. Figure drawn by the authors.

The three authors bring backgrounds in design, heritage, art history and sociology to the study. The designer analyzed the product lineage, Ball innovation and teardown; the MoDiP curator assessed the two DC01s' condition; and the cultural historian interpreted the findings. The tangible archive is the assembled product lineage. Design comparison, condition reporting and teardown provide physical evidence. Material culture and object biography inform its historical interpretation. Published sources support chronology and context for interpreting the physical evidence.

2.1 Dyson Upright Vacuum Case Study

In this research the Dyson upright vacuum cleaner is presented as a single case, with each model representing an embedded unit [37]. Introduced in the early 1990s, Dyson's bagless cyclonic vacuum cleaners became widely recognized examples of contemporary consumer product design. Their distinctive transparent dust containers and cyclonic airflow systems positioned them as technically innovative alternatives to conventional vacuum cleaner designs.

The study focuses on a lineage of Dyson upright models examined in two distinct evidentiary contexts. The first is a Dyson DC01 preserved in the Museum of Design in Plastics (MoDiP), where the object has been conserved as part of an institutional design collection. The second consists of several post-consumer examples of Dyson vacuum cleaners acquired through repair channels and secondary circulation. **Table 1** describes each sample.

The study includes examples of 18 of the 20 identified Dyson upright models released in the UK market—spanning the DC01 launched in 1993 to the UP34 acquired new in 2023. Colorways, limited editions and accessory variants were treated as versions of their corresponding model rather than separate models, only UK models were included. While the majority of Dyson upright models were collected for the study, not all models could be included due to availability—as a global business, some variants such as the DC43 were market specific and therefore not accessible for analysis.

Seventeen models are represented by post-consumer machines, providing chronological coverage for evolutionary comparison [17].

Table 1. Dyson upright case-study samples. Table compiled by the authors.

Model	Year Launched	Model Description	Case study samples		
			Colourway	Serial Number	Source
DC01	1993	Dual Cyclone™: first Dyson upright design with two-stage cyclonic separation.	Grey and yellow	700-A-3049??	Repair shop
			Grey and yellow	500-B-000215	MoDiP museum
DC03	1998	Dual Cyclone: slim, lightweight upright with brush-bar clutch and HEPA filtration.	Grey, yellow and purple	034-UK-59344	Private Household
DC04	1998	Dual Cyclone: full-size upright with revised housing and airflow path.	Grey and yellow	060A 235148	Repair shop
DC07	2001	Root Cyclone™: first Dyson upright with a multi-cyclone assembly.	Grey and yellow	131-UK-D 19995	Repair shop
DC14	2004	Root Cyclone: full-size upright with revised ducting and telescopic wand.	Grey and yellow	170-UK-A 75724	Repair shop
DC15	2005	Ball™: first Dyson upright with ball steering and the motor housed inside the ball.	Grey and yellow	200-UK-A 45215	Repair shop
DC18	2006	Root Cyclone: slim, lightweight upright with a narrow chassis.	Grey and gold	320-UK-A50897	Private household
DC24	2008	Ball: compact upright with a telescopic folding handle.	Grey and gold	532-UK-E61747	Repair shop
DC25	2008	Ball: full-size upright with ball steering and an articulated cleaner head.	Grey and gold	480-UK-R32617	Repair shop
DC27	2009	Root Cyclone: wheeled upright with an auto-adjusting cleaner head.	Silver and gold	592-UK-A 73496	Repair shop
DC33	2010	Root Cyclone: full-size wheeled upright with a telescopic wand.	Silver and purple	CT8-UK-DNA2668A	Private Household
DC40	2012	Radial Root Cyclone™ and Ball™: compact upright with a reduced-diameter ball assembly.	Silver and yellow	HP5-UK-HAA9507A	Repair shop
DC41	2012	Radial Root Cyclone and Ball: full-size upright with the motor housed inside the ball.	Grey and blue	DA9-UK-DEA0016A	Repair shop
DC50	2013	2 Tier Radial cyclones and Ball™: compact, lightweight upright	Grey and gold	HR7-UK-GAA5763A	Repair shop
DC55	2014	Dyson Ball Total Clean: full-size Ball upright with washable filtration	Grey and silver	*Not recorded*	Refurbished for resale
DC75	2014	Cinetic Big Ball™: full-size upright with filter-free Cinetic cyclone separation	Silver and red	JD4-UK-JEA4060A	Repair shop
UP22	2017	Light Ball™ Origin: lightweight upright with reduced electrical input	Grey and yellow	VR6-UK-KFA5698A	Repair shop
UP34	2023	Dyson Ball™ Animal Multi-floor: upright with a de-tangling cleaner head	Silver and copper	W6P-UK-SDA1715A	Acquired new

Five generations were defined through comparison of the physical products, using changes in product architecture as the basis for grouping them [18, 34]. Changes in cyclone technology, steering mechanism and chassis structure were considered where they altered the underlying architecture. Generational boundaries were identified where these systems have been substantially reconfigured.

The DC01 was selected for comparative analysis as there was a direct comparator in the MoDiP collection. As the first model in the Dyson upright lineage it provides a baseline for comparison. The samples are split into two categories:

2.1.1. Tangible Archive Samples

These objects have circulated through domestic and repair environments and retain traces of their operational life. Thirteen of the post-consumer samples were acquired from an electrical repair shop, which had retained them as potential sources of spare parts during supply-chain shortages associated with the COVID-19 pandemic. Their histories before entering the shop could not be verified. Three samples were acquired directly from private households and one had been refurbished for resale. **Table 1** records these acquisition routes.

Where machines were acquired directly from previous owners, their reported use, condition and reason for disposal were recorded. The DC18 was demonstrated in working order immediately before acquisition and collected dirt from the owner's floor during the demonstration. Other machines had incomplete histories, and some had evidently passed through more than one owner.

The tangible archive was assembled through the research from surviving products acquired through these different routes, rather than existing previously as an established collection. Most post-consumer machines were damaged, incomplete or no longer operating normally, reflecting prolonged use beyond the manufacturers warranty period. Scuffed clear bins, chipped plastics, accumulated dirt and damaged or substituted components recurred across models acquired from different sources. This consistency shows these recurring deterioration pathways among the objects examined. The samples can only represent the limited ownership, use and disposal pathways found in this study.

2.1.2. Museum Object

The research partnered with the Museum of Design in Plastics (MoDiP), an accredited museum with a focus on design using plastic. The MoDiP collection provided insight into the curation and care of historic Dyson upright vacuum cleaners. MoDiP provided expert advice and access to their accessioned collection of Dyson products – including an original, unused example of the first DC01 model. Handling of the MoDiP DC01 followed museum conservation protocols for plastic objects [4] and no disassembly or intervention was undertaken in accordance with the UK Museum Accreditation Scheme.

2.2. Object Analysis

The study characterizes 30 years of product development history through physical analysis of 18 Dyson vacuum cleaners, each vacuum cleaner was examined to identify changes in form, materials and construction across the lineage [35].

Patents were used as supplementary documentary evidence. A purposive, non-exhaustive search of Espacenet combined the technology descriptors "vacuum" and "spherical," the applicant name "Dyson," and inventor names including James Dyson to identify patents relating to the development of Dyson Ball technology. No date restriction was applied. More than 30 patent documents were examined in relation to features observed in the physical samples, including rolling support assemblies and yoke arrangements. As patents provide partial evidence of technological change [38], only documents contributing directly to the comparison and **Figure 6** are cited.

3. Results

The study examined 2 unused and 17 post-consumer Dyson upright vacuum cleaners, each showing different degrees of wear, repair and material change accumulated over their respective lifetimes. Together, the samples provide a cross-section of the Dyson upright lineage, enabling observation of recurring design features and changes in materials and technology. The variation in condition across the collection offers a material record of how these products have been used, maintained and repaired over time.

3.1. Dyson Upright Product Family

The 18 Dyson upright vacuum cleaners pictured in **Figure 2** form a 30-year product lineage. Across this collection, recurring features, architectural changes and material developments provide a physical record of how the Dyson upright family evolved.

The key technological innovation of the first model, the DC01, was the dual-cyclone separation system, which introduced elements such as the transparent collection bin and removable wand handle that persist in later models and establish the platform on which subsequent designs were built.

Figure 3 presents the timeline of new product introductions across the first three decades of the Dyson upright range. Gen. 1 comprises the original DC01 architecture. Gen. 2 (DC03–DC14) contains the conventional wheeled uprights developed through revised housings, cyclone arrangements and ducting. Gen. 3 (DC15–DC18) begins with the introduction of the Ball architecture and associated alternative slim designs. Gen. 4 (DC24–DC33) comprises the subsequent compact, full-size and wheeled developments produced through more extensive variation of these architectures. Gen. 5 (DC40–UP34) begins with the later compact Ball and Cinetic platforms and continues through the more architecturally stable recent uprights.



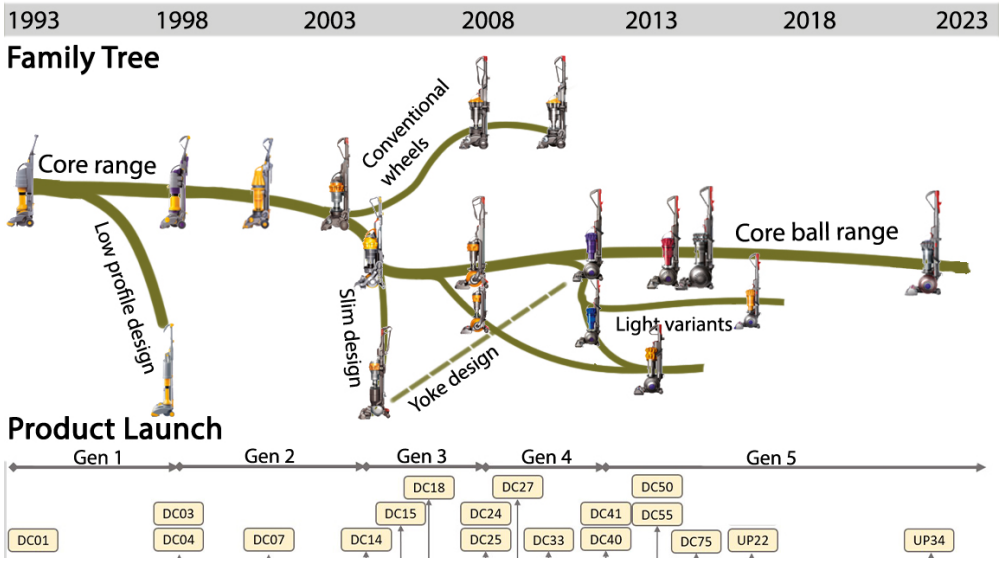
Figure 2. Tangible archive of post-consumer Dyson upright samples. Figure provided by the authors.

The DC01 (Gen. 1), launched in 1993, remained in production for nearly ten years. This extended run was supported by the release of several limited-edition variants, which maintained market interest and allowed the core design to remain commercially viable. With the launch of the DC04, the Gen. 2 products introduced revised housings, updated cyclone layouts and improvements to manufacturability, becoming the principal line through the early 2000s.

In the first decade of the lineage, only four upright models were released; however, the frequency of new product introduction increased significantly after the mid-2000s. This acceleration aligns with broader industrial trends towards shortened product cycles and increased pressure for iterative technological updates [39]. The Gen. 3 and Gen. 4 models exhibit intensive product development activities, including the introduction of ball-steering architectures, compact chassis designs and new approaches to ducting and internal airflow management. These changes represent major architectural shifts within the product family.

In contrast, more recent Gen. 5 products show a period of convergence. Form, architecture and core technology stabilize, with refinements occurring within an increasingly mature design platform. Across all five generations, the Dyson uprights illustrate an evolutionary model of product development in which technology platforms underpin successive models. Aspects of the original architecture—particularly cyclone design, handle/wand assembly, and bin configuration—become stable technological platforms that are incrementally iterated across the product family [40].

Figure 3. Timeline of new product introduction across the first 30 years of the product lineage. Figure drawn by the authors.



The timeline and generational classification reveal a coherent pattern of product-family evolution. The tangible archive captures this trajectory physically, showing how distinct models carry forward, modify or replace platform elements. This provides a material foundation for examining design continuity and technological progression across the Dyson upright lineage.

3.2. Intergenerational Design History: the Ball

Product features that are introduced to the product family do not always remain constant. This development history can be tracked across the product family. The Ball wheel shown in **Figure 4** provides an example of a significant change that was then developed over multiple iterations of the Dyson product line.

The ball roller was introduced into the 3rd generation DC15 model. The traditional four-wheeled design was replaced by a new "ball" concept with no previous history within the product line. The ball roller feature was introduced to provide more maneuverability, with a low center of gravity achieved by housing the motor within the ball [41]. The transition from the previous DC14 architecture to the DC15 therefore provides a clear point at which a new feature can be traced within the product lineage.



Figure 4. Transition from 2nd (DC14) to 3rd (DC15) generation Dyson upright vacuum cleaners. Figure provided by the authors.

Described as a "core technology" by James Dyson [41], the roller ball marks a key development in the history of the Dyson upright vacuum. Dyson marketed the DC15 as "The Ball" and highlighted how the feature was an advance in technology. After a year on the market the DC15 was the leading model of Dyson upright vacuum cleaners [42].

Implementation of the ball-roller design required significant development of the vacuum cleaner architecture. The motor housing, airflow, tilting mechanism and cleaning head all required extensive redevelopment to accommodate the new design. The Dyson design team took the design decision to change the motor location to inside a ball-roller arrangement, as opposed to the previous conventional location within the main body of the appliance.

Several developments were required in order to realize the ball concept: routing the air inlet and outlet through the axle of the ball-roller to the motor; packaging the motor and filter assemblies within the moving ball-roller; the geometry of the assemblies to ensure the product maneuvers correctly; routing airflow from the cleaning head to the body; and designing the pivoting cleaning-head mechanism to create contact with the floor when the product is tilted.

The concept of "the ball" was subsequently redeveloped over multiple iterations of the Dyson product line. The research samples demonstrate how each model developed from the previous release, with functional assemblies and mechanisms changing across the product family. The technical challenges of the roller-ball design realized in the DC15 were further refined in the DC24 and DC25 models. The DC25 followed previous Dyson upright iterations but was launched alongside the miniaturized DC24, creating a smaller and lighter version while maintaining the design language of the brand.

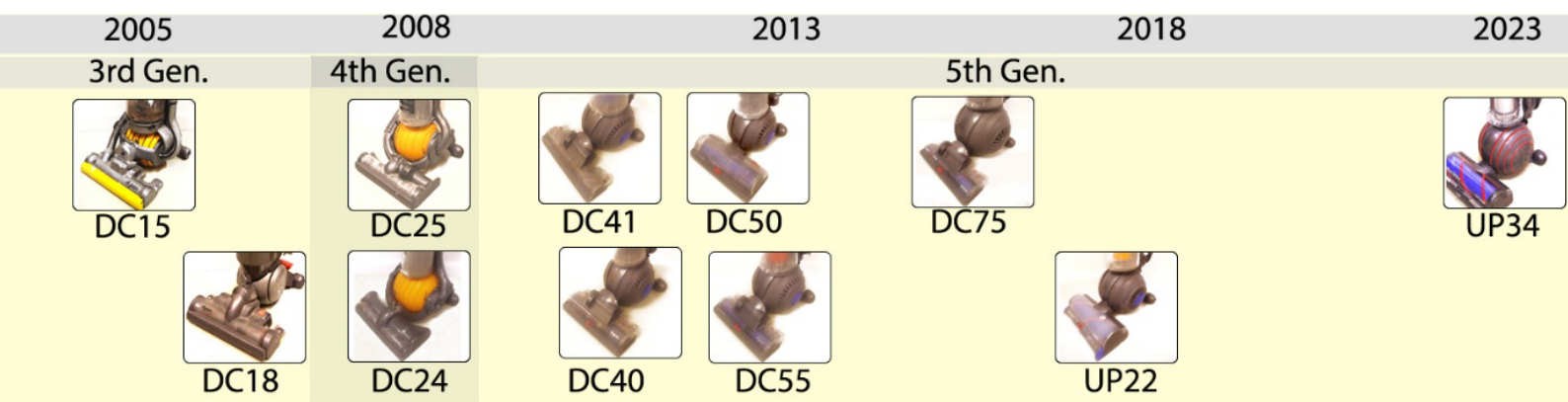
Figure 5 represents the commercialized Ball and yoke designs, showing how the steering assembly changed across the models examined. Examination of the physical samples allow the changing implementation of the Ball to be followed through successive generations.

The roller-ball design was replaced through development of the DC18 yoke solution. While the Gen. 5 Ball was stylized to be more spherical, the functional concept is very similar to the DC18 mechanism, which includes a central yoke [43] housing the pivoting mechanism, clutch and brush-bar interface. The Gen. 5 design resolves the Ball concept without the need for the motor to be encased in the rolling mechanism or for air ducts to be routed through the axles.

The introduction of new product features during the 3rd and 4th generations provides insight into these development streams. The DC24 and DC25 models also mark the point at which multiple related models were launched using shared product approaches [33]. By the 5th generation, a combination of the Slim and Ball models had been pursued across the product line. The launch of the DC40 and DC41 marks a period of consolidation in which the architecture of the 5th generation product line matured and stabilized.

The development of the Ball can also be considered alongside the documentary record of the technology. The Dyson Ball was protected through an extensive patent portfolio, with a selection of these inventions illustrated in **Figure 6** showing different technical arrangements associated with the development of the feature.

Figure 5. Dyson ball-roller evolution from the initial design introduced on the DC15 through to the latest UP34 iteration. Figure drawn by the authors.



The documents in **Figure 6** were selected for the product features they illustrate: US 7,581,285 [44] concerns components housed within a rolling support; US 2008/0115313 [45], US 7,607,196 [46] and EP 2,059,159B1 [47] concern different features associated with the Ball assembly; and GB 2,474,475A [43] concerns a later development of the yoke and wheel arrangement. Together, these documents trace aspects of the technical development of the Dyson Ball.

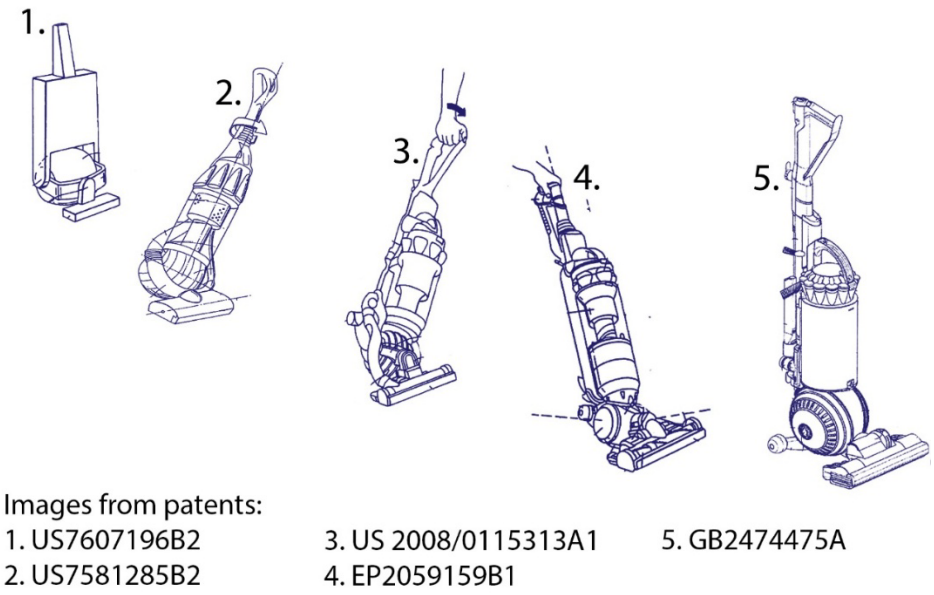


Figure 6. Selected patent documents from several Dyson Ball-related patents. Figure drawn by the authors.

Across the product family, the Ball therefore provides a feature whose development can be tracked through physical products over time. The initial DC15 arrangement, subsequent DC24 and DC25 products, the DC18 yoke solution and the later Gen. 5 configuration show how the implementation of a recognizable product feature changed across successive generations of the Dyson upright vacuum cleaner.

3.3. DC01 Comparative Object Analysis

Directly comparing the two DC01 objects in this study enables the study of different product lifetimes. Though similar in design and manufacture, the two objects shown in **Figure 7** are materially different.

Figure 7 places the two DC01s alongside their serial stickers. The stickers identify the earlier 500 and later 700 production series and show different electrical ratings. The photographs also show their contrasting condition. A curatorial assessment of these objects was carried out to provide a direct comparison of the current condition in **Table 2**.



Figure 7. Two DC01 samples in the study: Post-consumer DC01 object (top left) and Serial sticker (bottom left). MoDiP DC01 object (top right) and serial sticker (bottom right). Figure provided by the authors.

The Dyson DC01 was a model launched in 1993 and produced through several revisions. Their serial plates identify different production specifications. The MoDiP object belongs to an earlier series manufactured at Chippenham before production transferred to the larger Malmesbury factory in August 1995 [48, p. 246]. The post-consumer object belongs to the later 700 series manufactured at Malmesbury between 1995 and 1997 (dated via serial sticker). These are minor variations within the same DC01 design. They distinguish phases of manufacture, while wear, replacement parts and service stickers record the objects' later histories.

Table 2. Curatorial DC01 Assessment. Table compiled by the authors.

	Sample description	
	Post-Consumer sample	**MoDiP example**
Model	DC01	DC01
Production series	700 series	500 series
Serial number	700-A-3049??	500-B-000215
Manufacture date	1995–1997	Before August 1995
Manufacture location	Malmesbury, UK	Chippenham, UK
Electrical rating	1100W nominal	1275W nominal
Compliance	CE, BEAB	BEAB
Provenance	Earlier history unknown; collected by a repair shop during COVID-19 and acquired for research in 2023.	Acquired from new by MoDiP; unused.
Visible state	Fair—physically complete no attachments	Good -physically complete with all attachments and original features
Storage	Currently in open storage in busy stairwell without covering or controlled environment.	Locked in a museum grade storeroom, wrapped in Tyvek with limited lighting and controlled temperature and rh.
	Condition assessment	
Handle	replaced (different color) has adhesive residue and detritus and surface dirt in grooves.	material color changed, self-adhesive label clean and intact.
Front body	has original self-adhesive label although those on the shoulders have become scuffed. Additional service sticker at front top of body. Body has changed color,	has original self-adhesive labels, and swing tag booklets all clean and intact. Body has changed color.
Clear bin	scratched and containing residue of dust.	couple of patches of surface scratching but otherwise clean.
Lower body	scratching and surface dirt, self-adhesive label scuffed and dirty. Original color under foot plate, surface dirt and scratching.	original color under foot plate.
Foot Plate	extensive scratching, pitting and surface dirt, applied label scratched. Side corners heavily scratched and chipped.	applied label in good condition, material color change to one side.
Front bumper	loose at front with surface dirt.	low level surface dirt.
Rear body	evidence of wear and possible burning around cable outlet.	material color change.
Cable and plug	replaced, surface dirt and with PAT test label attached.	original.
Lower rear body	serial number plate partially pulled away and worn. Additional self-adhesive label.	serial plate intact and clean.
Wheels	surface dirt.	clean
Underside	surface dirt and scratching, material yellowed.	one long scratch across base, material color change.
Lower foot plate	original color.	material color change.
Brush surround	separate, surface scratching.	moulded as part of lower footplate.

The post-consumer example shows evidence of extensive use, including a replacement handle and plug, adhesive residue, surface dirt in grooves, scuffed labels and a scratched, dust-stained clear bin. Areas such as the foot plate, wheels and lower body display heavy wear, pitting, discoloration and accumulated grime, with additional service stickers and a PAT label recording electrical safety testing and potentially indicating non-domestic use and repeated interventions over time. By contrast, the MoDiP sample has been preserved as a reference object within controlled museum storage, retaining original attachments, intact labels and minimal surface wear. While some color change is visible and is consistent with ageing plastics, the overall condition remains stable, clean and complete.

3.4. Post-Consumer DC01 Teardown

As the post-consumer DC01 is not under protection of museum protocols it can be used for destructive analysis.

The teardown provides access to internal functional components such as seals and springs shown in **Figure 8** which are not available for inspection when assessing the fully assembled product.

Components observed during the teardown showed varying forms of wear and degradation. Bleed valves, springs and seals exhibited corrosion, dirt accumulation and embrittlement. The cone and shroud assembly contained fine debris residue that indicated airflow dynamics and clog points. Rubber gaskets had perished, reducing their ability to form effective seals. The transparent bin showed scuffs and scratches that reduced clarity. These observations illustrate material changes that occurred during long-term use.

The post-consumer sample can therefore reveal internal conditions and degradation mechanisms that are not visible on the museum-held DC01.

Table 3. Product Teardown. Table compiled by the authors.

Component	Function	Material	Object analysis
Retaining screw	Holds cyclone top assembly to cone	Crosshead metal screw	Screw head wear suggests servicing
Top housing / carry handle	Structural top and integrated handle	Grey moulded plastic	Surface scuffs and grime buildup on handle indicate habitual carrying points
Bleed valves and seals (×3)	Pressure-release under blockage	Yellow plastic plugs with Black rubber discs	Components are dirty from being in the airflow. Rubber is corroded and embrittled
Bleed valve springs (×3)	Keeps valve closed under normal pressure	small steel springs	All 3 springs are corroded
Cone and shroud assembly	Main cyclone cone for airflow spiral	Yellow plastic (dust-stained)	fine debris residue visible on the surface and in corners shows airflow dynamics and clog points
Lower cone and seals assembly	Seals bottom interface to lower motor housing	Rubber gasket	fine debris residue visible on the surface. Rubber has perished reducing ability to form a seal
Bin	Collects dust and debris	Transparent plastic (polycarbonate)	Scuffs and scratches from use have reduced the transparency of the bin

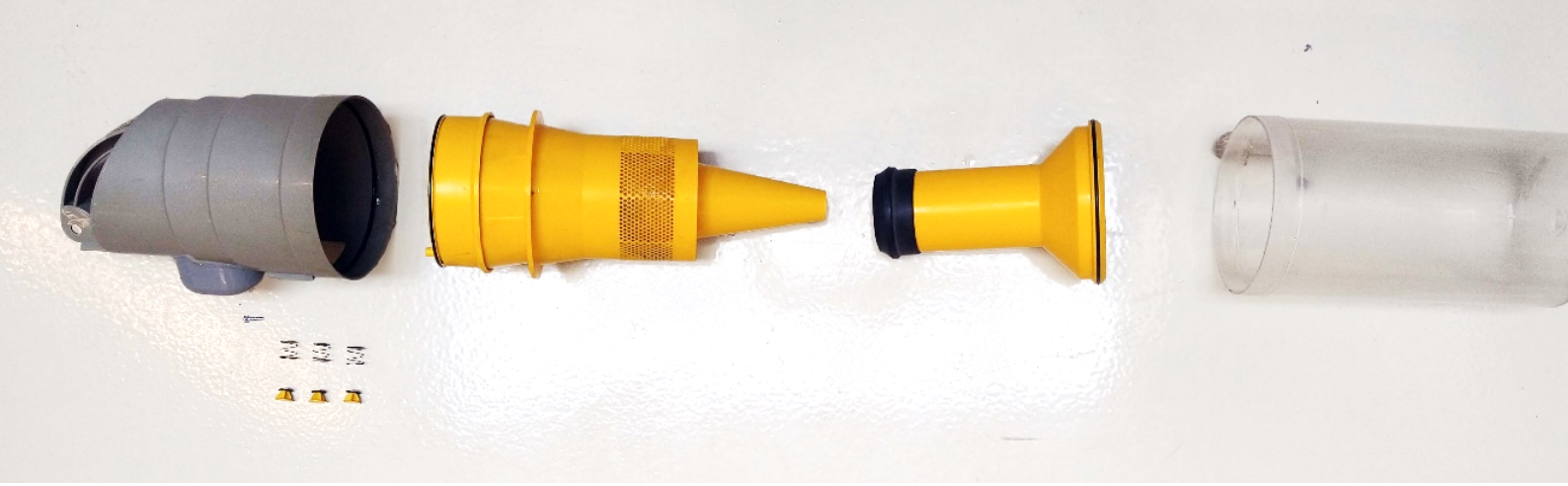


Figure 8. Post-consumer Dyson DC01 bin assembly teardown. Figure provided by the authors.

4. Discussion

The Dyson collection demonstrates that the historical knowledge obtainable from designed objects depends on what happens to them over time as evidence accumulates across the life of a "single" designed product. Some traces sit in the physical lineage of commercial models, others in patents that freeze particular aspects of technical development.

Across the thirty-year product lineage, several temporal relationships become visible as successive commercialized products record changes in design while individual examples from earlier generations continue to exist and acquire their own material histories. The patent material provides a partial documentary record of design development alongside those commercialized products. Design development and the continuing lives of manufactured objects therefore overlap rather than forming a single chronological sequence.

These sources unsettle the more orthodox approaches that center primarily on conception, manufacture and market introduction, as evident in the James Dyson biographies [41, 48]. The present study adds a material and temporal dimension to contemporary design history discourse on consumption, mediation and everyday life [7, 11, 12, 13], by showing that artefacts do not remain fixed between their production and their later interpretation as historical evidence.

Bringing these separately surviving objects and documentary sources into comparison forms the basis of the tangible archive as a structured evidentiary source. The following discussion considers the material and evidentiary differences between the two DC01s, the overlapping temporalities visible across the product lineage, and the value of the tangible archive as a method for design-historical enquiry.

4.1. Product Design, Materiality and Evidentiary Difference

The two DC01 examples originate from the same design and approximately the same historical moment, yet thirty years of different trajectories have produced materially different sources. Chronological age alone therefore does not determine the historical information that an artefact carries. Their differences record both minor changes during manufacture and the different paths the objects took after production.

The MoDiP DC01 has been retained in a controlled institutional environment, while the post-consumer example has passed through use, repair and servicing before entering the tangible archive.

The "product as designed" MoDiP DC01 displays minimal wear and remains a more stable, socially recognizable configuration. Its original components, materials, styling, color relationships, labels and surface finishes demonstrate the design intent embodied in the product by the development team [48, pp. 193, 196, 199–201]. The MoDiP DC01 material ageing has continued during its thirty years in the museum collection, but the object serves as a point of reference for the original materials and design. Museum collection and conservation practices inevitably shape what remains available for later interpretation [20, 24, 27]. In plastics, preservation does not halt material change altogether, as evidenced by the color change visible in the MoDiP object [4, 31]. However, museological and preservation practices inevitably limit many of the interventions associated with normal operation. The post-consumer example carries marks and retains sociotechnical evidence of use post manufacture.

The commercial success of the Dyson products is well understood, the post-consumer objects provide an additional form of evidence. They show how the design in plastics functions in the wild through handling and extended use contributing wear, and the wider maintenance and repair services that support the continued working life of the product. Teardown exposes internal corrosion, degraded seals, residues and evidence of servicing. The failures visible in these objects show how materials and components performed during use, making their condition part of the design's history [23, pp. 18, 21]. Such traces are consistent with approaches that understand artefacts as continuing social and material circumstances rather than becoming historically fixed at manufacture [9, 10].

By comparing the "product as designed" museum reference and "used" post-consumer examples, material change can be considered as evidence as to what happened to those design decisions over time rather than only as deterioration. This makes it challenging to regard the museum object as the complete historical source and the post-consumer object simply as its degraded counterpart. Preservation has retained evidence that use has removed; continued use has produced additional evidence, while material alteration also carries historical information as well as material loss. Yet, none of those is a self-explanatory or self-evidentiary source. The replacement handle, for example, provides evidence that an intervention occurred but does not independently explain when or why it was replaced. Material traces become more useful when considered through comparison and contextual interpretation, where apparently minor evidence can contribute to the reconstruction of historical processes [16].

The paired DC01 comparison strengthens that interpretive process because material differences can be read relationally. Features retained on the MoDiP object help identify alterations in the post-consumer example, while the latter preserves evidence of processes absent from the museum object. Plastic ageing also becomes historically relevant in this comparison because changes in color, transparency, flexibility or sealing capacity show

what happened to materials originally incorporated into the product under different conditions of survival.

Material culture approaches treat objects as continuing to acquire histories after manufacture [8, 9, 10]. In the two DC01s, color change in the museum object and scratches, residues and degraded seals in the post-consumer object form part of those histories. Comparing their condition makes plastic ageing and alteration evidence of the design's material life.

4.2. Product Lineages and Overlapping Temporalities

Across the tangible archive, product family links between models become materially evident. Recurring components, revised housings and shared platform features physically demonstrate continuity and change across the lineage. Looking across successive products makes it possible to follow how features are carried forward, modified or replaced over time [17, 18].

Looking across the thirty-year lineage, another temporal difficulty emerges: the orderly chronology implied by product-lineage studies sits uneasily alongside the ongoing lives of the individual objects themselves. Approaches that trace continuity and change across related products [17, 33, 40] present a stable sequence of models, yet the Dyson collection shows that this sequence is constantly intersected by the wear, repair, and idiosyncratic histories of particular artefacts.

The development of the Ball provides a clear example. Introduced with the DC15, the Ball remained a recognizable feature of later Dyson uprights, although its technical implementation changed. The physical lineage records the commercialized products and shows how the realized arrangement developed across successive generations, from the original DC15 configuration through later solutions including the DC18 yoke arrangement and the Gen. 5 products. The continued presence of the Ball therefore represents continuity within the product family, while the changing architecture records the development of the design over time.

The initial Ball designs required substantial reworking of the motor, airflow path and steering assembly. Across the subsequent models, those arrangements changed markedly and by Gen. 5 they had settled into a configuration that remained substantially consistent across the later uprights examined here. The lineage therefore shows a period of intensive development followed by consolidation. The commercialized products provide only part of this history. Design development occurring before product releases is only partially visible in the finished objects. The patent record offers a different vantage point, freezing particular technical arrangements associated with development, while the commercial products show the versions that were actually realized in manufacture. Neither source captures the full design process, yet each one reveals a different part of the ongoing work through which the Ball was repeatedly re-worked.

The history of the product is also more complex than a comparison between an original design and its later deterioration. Features of the DC01 changed during the period in which the product remained in manufacture. Different motors, upgraded components and changes

associated with cost reduction—including changes to branded plugs, occurred while the product was established in the market. Reducing defects and production costs are important drivers of in-market development [34]. Dyson describes customer and assembly feedback leading to redesigned parts and changes in suppliers' production methods [48, pp. 266, 268–69]. This is evident on the DC01 samples in this study and makes the distinction between an "original" design and its later material history less straightforward than a product chronology implies.

The product lineage also exists alongside the continued lives of the individual products within it. The introduction of a later model does not bring the history of an earlier product to an end. Earlier uprights continue to be used, maintained, repaired, stored and circulated while later generations are being developed and introduced. Edgerton's emphasis on technologies in use [19] is relevant here because it draws attention to the persistence of products beyond their moment of innovation or market introduction. Across the thirty-year Dyson collection, successive generations of design therefore coexist with products from earlier generations that continue to accumulate their own material histories. The result is a complex temporal picture of overlapping object lifetimes. The Ball sequence records changes made to the design across successive commercialized products, while the two DC01 examples show how individual examples of the same design can develop differently after manufacture through use, repair and preservation. Changes between products occur alongside changes within surviving products. Later models can enter production while earlier ones remain active, situated in the wild [25].

Design history can consequently attend both to the transformation of the designed product across generations and to the transformations undergone by individual instances of that product after production. The lineage allows two related histories to be examined without conflating them: the development of the product family across successive designs, and the continuing histories of individual machines after manufacture. The Ball and patent evidence illuminate the first; the surviving condition of the DC01s illuminates the second while their intersection provides a more temporally complex account of product history than either chronology alone.

4.3. Tangible Archives as a Method for Design-Historical Enquiry

The tangible archive itself also has a history. The eighteen Dyson uprights did not survive together as an established collection, but were assembled retrospectively through the research from products that had survived through different routes. Many of the samples became available because they had been retained by an electrical repair shop as sources of spare parts. This is consistent with the wider argument that archives are shaped through selection, retention and loss rather than preserving neutral or complete representations of the past [14, 15]. Their later value as historical material was therefore not the reason for their original retention. Its value lies in the comparisons made possible once separately surviving artefacts are considered as a lineage.

The tangible archive can therefore be considered as a structured evidentiary source. Bringing the products together creates relationships that were not available when the objects existed separately in homes, repair environments or storage. Their arrangement as a product lineage allows changes between commercialized products to be compared, while their individual condition records the different histories accumulated after manufacture. The tangible archive therefore combines evidence of the development of the product family with evidence of the lives of the surviving objects.

Those comparisons operate across different sources and conditions: the product family makes continuity and modification visible across commercialized designs; individual objects preserve traces of later material histories; the MoDiP DC01 provides a preserved comparator; patents provide selected documentary evidence of development; and teardown makes internal evidence accessible from an object whose status permits intervention. The tangible archive therefore complements rather than replaces museum and documentary sources, while enabling questions that cannot be addressed through any one of them independently.

The tangible collection is large and cannot be accommodated within MoDiP, and many post-consumer examples are not suitable for accessioning. This means the archive is necessarily transient. Yet its impermanence is also part of its value: it enables hands-on investigation, including teardown, material comparison and active handling, not possible with curated heritage objects [21]. The teardown of the post-consumer DC01 demonstrates how this different status makes internal conditions and degradation mechanisms available for investigation that cannot be examined through the accessioned museum object.

The post-consumer objects also show how Dyson uprights circulate through wider sociotechnical systems. The PAT label records an electrical safety assessment during the object's in-use life. Alongside the service stickers and replacement components, it demonstrates that the vacuum underwent testing, servicing and alteration beyond its ordinary function as a domestic cleaner. These sociotechnical systems contribute to the survival of the objects themselves. Some of the post-consumer machines survived because they remained useful as working products, could be repaired, or retained value as sources of spare parts. The MoDiP DC01 survived through a different route, through its selection, accession and preservation as a museum object. The different ways in which products remain in circulation, are retained or are removed from use therefore influence the material evidence that later becomes available for design history.

This is particularly relevant to design history because artefacts may be both the objects whose histories are being investigated and material sources through which those histories are reconstructed [7, 8]. A product encountered after decades of conservation, continued use, repair or storage is not materially equivalent to the product at manufacture, even where its model designation remains unchanged. The history of the source itself therefore becomes methodologically significant.

The comparison also exposes the selectivity of survival, as some products remain because they entered museum collections; others because they remained useful, repairable or worth retaining for components, while others disappear through disposal, recycling or

disassembly. Trouillot's attention to the production and absence of historical sources reveals that what is unavailable can shape historical knowledge as much as what survives [15]. For mass-produced design, large original production numbers do not guarantee an evenly preserved record of different markets, users, variants or product lives.

These different sources contribute to the construction of different accounts of the same product design history. The corporate narrative records the development and promotion of the product, the museum object preserves a particular example substantially as designed, the patent material provides a partial documentary record of design development, and the post-consumer tangible archive retains sociotechnical evidence of use post manufacture. Bringing them together extends the interpretation of the Dyson upright beyond its introduction as an innovative product and includes the different ways in which the design continued to exist and change over time.

The contribution of the tangible archive is consequently methodological rather than archival in an institutional sense. Bringing surviving products together establishes relationships through which differences in design, use and material condition can be interpreted, while making the contingencies of their survival visible. It neither makes post-consumer objects intrinsically more authentic than museum objects nor diminishes the value of conservation. Different routes of survival preserve different evidence and support different historical questions.

This leads to the broader question of how different practices of collection, continued use, repair, industrial retention and disposal shape the evidence available to future design histories, and what responsibilities follow when objects not formally recognized as heritage nevertheless acquire value as historical sources.

Conclusion

This study has examined a thirty-year lineage of Dyson upright vacuum cleaners to consider how designed products can contribute to the construction of design history over time. The post-consumer examples show continuity and change across the commercialized product family, while the Ball provides a more focused example of how a recognizable feature was developed through successive technical iterations. The patent record complements the physical lineage by providing partial documentary evidence of the design development behind those commercial products. The comparison between the two DC01 examples adds a different history, showing how examples of substantially the same design can become materially different through the lives they subsequently experience.

The MoDiP DC01 preserves much of the product as designed and provides a point of reference for its original materials, components and features. The post-consumer DC01 records a different product life and makes visible material change, intervention and servicing that are largely absent from the preserved example. Teardown extends this evidence into the internal structure of the appliance. Neither object provides a complete history of the DC01, but together they demonstrate how different conditions of survival produce different historical evidence.

The wider lineage introduces a further temporal dimension. Successive commercialized products record the development of the Dyson upright, but products from earlier generations continued to exist while later products were being developed and introduced. The history of the product family is therefore a complex temporal picture of overlapping object lifetimes. Design development, manufacture and the continuing material lives of products in use do not occur as separate historical stages. They overlap, producing different forms of evidence that can be examined through the surviving objects and documentary record.

The tangible archive provides a way of bringing these histories into comparison. It is not a replacement for the museum collection, nor is it a complete or neutral record of the Dyson upright. It has been assembled retrospectively from products that survived through different routes, including continued use, repair, storage and retention for spare parts. The museum object has survived through accession and conservation. These different routes are part of the history of the objects themselves and influence what can subsequently be studied through them.

Temporality participates in the construction of historical knowledge by shaping the objects, material traces and documentary evidence from which histories are subsequently developed. The Dyson objects make this particularly visible because product development, overlapping object lifetimes, material change and different conditions of survival have produced different forms of historical evidence. What a designed object can contribute to design history therefore depends not only on what it was or when it was made, but on what happened to it over time and the conditions through which it remains available for interpretation.

This also raises wider questions for design history about the commercial products that survive and the cultures in which they existed. Museum collections, corporate histories and post-consumer objects preserve different aspects of design culture. Commercially successful products such as the Dyson upright were produced in large numbers and circulated widely, yet the examples that survive do not necessarily represent the full range of products, users or experiences associated with them. Market variants, changes made during production, repair practices, patterns of ownership and the eventual movement of products into reuse, parts harvesting or disposal all offer further routes through which the relationship between design and culture might be examined.

Future research could therefore extend the tangible archive approach beyond a single product family and examine how different patterns of production, consumption, repair, preservation and disappearance affect the design histories that can subsequently be written. Comparison between commercialized products, corporate and patent records, museum collections and surviving post-consumer objects could also reveal more about the relationship between design development and the wider cultural life of mass-manufactured products. Such work would help establish how far the temporal patterns identified in the Dyson lineage apply to other products and how ordinary commercial objects contribute to longer histories of design, technology and material culture.

Author Contributions:

Jonathan Burgess conceived and led the study, assembled and documented the product collection, conducted the product lineage and Ball analyses and the post-consumer DC01 teardown, and led the preparation and revision of the manuscript. Louise Dennis carried out the comparative condition assessment of the two DC01s and contributed expertise on museum collections and conservation. Yaneidys Arencibia Coloma contributed to the historical interpretation.

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The authors declare that this manuscript has been prepared with attention to inclusivity and has made every effort to use respectful, non-discriminatory, and inclusive language.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process:
During the preparation of this work, the authors used OpenAI ChatGPT (GPT-5.6 Sol) for language editing, structural review and copy editing only. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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