

Stuff and space in the home: space for storage as the forgotten design and well-being dimension in standardised housing

In the field of architecture, there has been scarce research on how the accumulation of material possessions impacts on space in the home. There has been little understanding of what households own, collect, store, and dispose of, nor the implications this might have for domestic space design, especially that for storage. The *stuff* that inhabitants own is largely overlooked in current debates on housing policy and design. Yet, householders can have their quality of life, well-being, and happiness negatively affected by the 'stuff' they keep in their homes. This study presents a critical, exploratory, and reflective enquiry into the relationship between stuff and housing design, using a multi-methodological approach that combines design research and a visual and sensory ethnography. The research engaged practising architects to propose innovative storage-focused housing design solutions by using architectural probes to enable them to think about housing design from an untested perspective. The findings present a unique exploration of how domestic space has changed overtime, capturing the intellectual agenda of the house as a 'container' and the household contents, the 'stuff', as the 'contained'. The study finds how multi-method explorative methodologies are a helpful analytical mechanism to creatively consider architectural design challenges that need to include diverse and often overlooked perspectives. Its main output is a new conceptual framework of material possessions, which identifies universal characteristics and categories to be used in housing design, and proposes innovative housing design solutions for the UK standardised house type. The study concludes that the design of future homes could better support inhabitants' quality of life and well-being if space for storage was better understood. It argues for a more informed approach to housing design, where storage is valued and the space provided is flexible, so the reality of inhabitants' 'stuff', and the associated well-being implications are considered.

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Introduction

The UK is currently in the midst of a housing crisis, in terms of the number of units available, their speed of delivery, and their viability.¹ The viability of

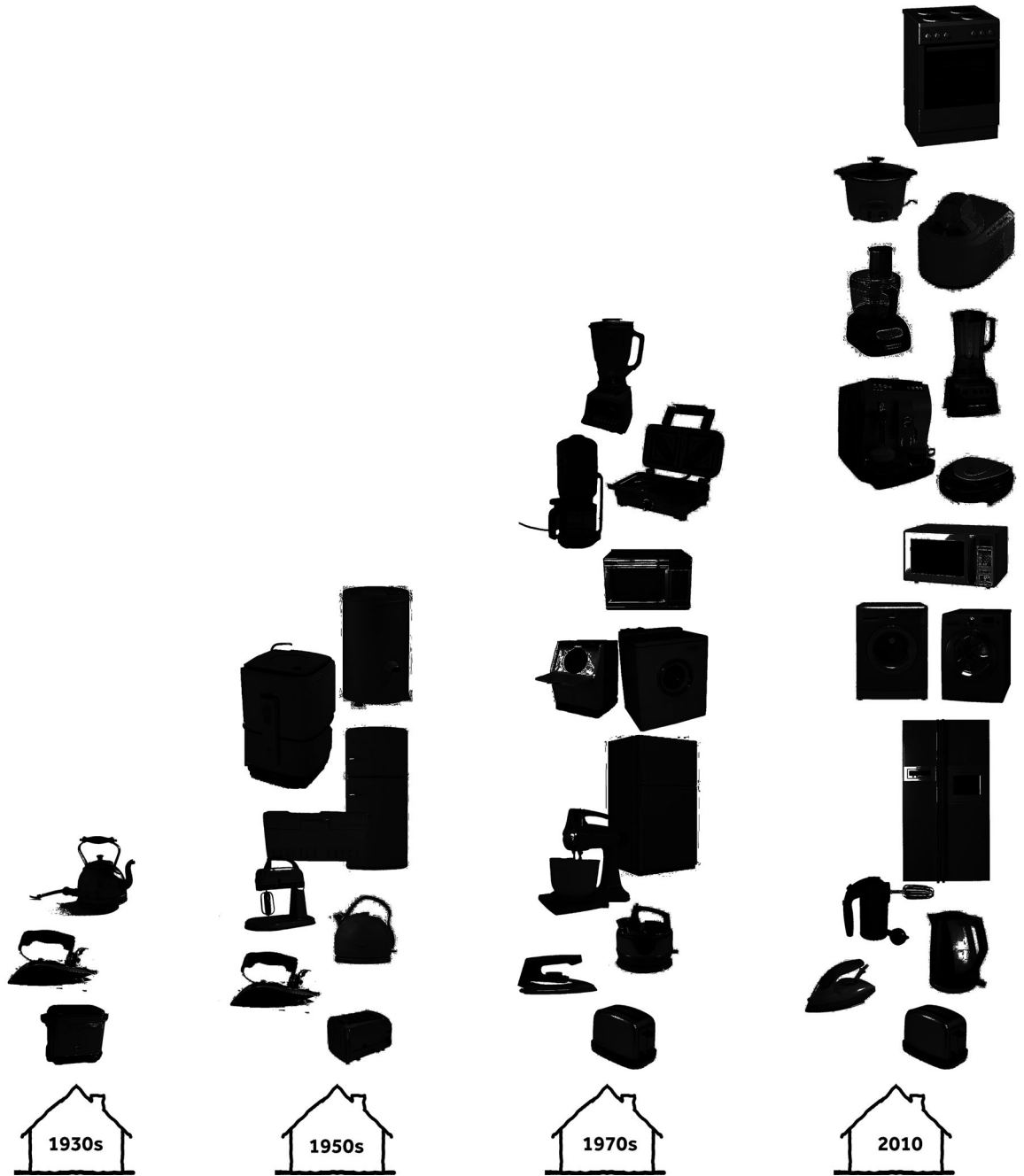
housing has had an impact on the space provided for living, and for storage. Since the removal of the Parker Morris standards in the 1980s, the UK has not had mandatory space standards.² Many organisations have published best practice guidelines for housing design to address the space problem, and the UK now has National Described Space Standards, but these are all optional.³ Nevertheless, their existence has still led to some house-builders arguing that they will lead to increased build costs and long-term difficulties for housing supply, since Local Plans could include the 'unjustified application of optional standards'.⁴

The delivery of housing has changed drastically since the 1970s, and currently a very small number of large companies deliver the vast majority of new houses.⁵ Whereas in 2000, forty-three house builders were responsible for almost 71% of all houses built in the UK, now only eight of the largest builders are responsible for more than 50% of new homes.⁶ Furthermore, in the last 15 years approximately 80% of all new housing has been provided by speculative house builders.⁷ Such developers tend to use specific housing portfolios with particular house layouts, developed principally from feedback received by sales and marketing departments. These layouts are repeated with modifications and with little innovation in different developments across the country.

Despite being criticised for building homes that do not provide enough space for basic activities or storage, house-builders across the UK have disputed the need for more space and for regulated space standards.⁸ Developers continue to reduce the size of houses to ensure drivers like profit margins, developments costs, and housing demand are addressed.⁹ In addition, the UK uses the number of bedrooms to market houses or collect housing statistics,¹⁰ rather than using overall dimensions, floor areas, or the suitability of the physical configuration of space. As sizes can vary notably between houses with the same number of rooms, this leads to a deceptive impression of houses being bigger than they are.¹¹ Moreover, with the modern desire for en-suite bathrooms, study rooms, and utility areas, more rooms are being squeezed into the same footprint, and living room, kitchen, corridor, and bathroom sizes have all been reduced as a result.¹² Space in new housing in the UK continues to be reduced and space for living is at a premium, with the functionality and liveability of homes being compromised.¹³

The evolution of domestic space over time has seen the demarcation between 'private' and 'public' space activities weakened, leading to boundaries of the spaces, historically demarcated, becoming blurred. This has led to new contemporary hybrid spaces, such as the kitchen-diner or open-plan living, being marketed as supporters of modern family life.¹⁴ Open-plan rooms continue to influence housing design today, especially when considering notions of adaptability, flexibility, mobility, and change.¹⁵ The literature shows that modern domestic spaces have evolved to become multi-functional and versatile, catering for an array of activities but within smaller footprints.¹⁶

In addition to being small, research has shown that the UK's homes also have inadequate storage provision (Fig. 1).¹⁷ In fact, storage is considered a key



weakness of modern housing design.¹⁸ Part of the problem is that space for storage is not highly valued by prospective house buyers. However, once new homes are occupied, inhabitants often report that there is not enough

Figure 1.
The evolution of stuff and the home, drawn by the author, 2017

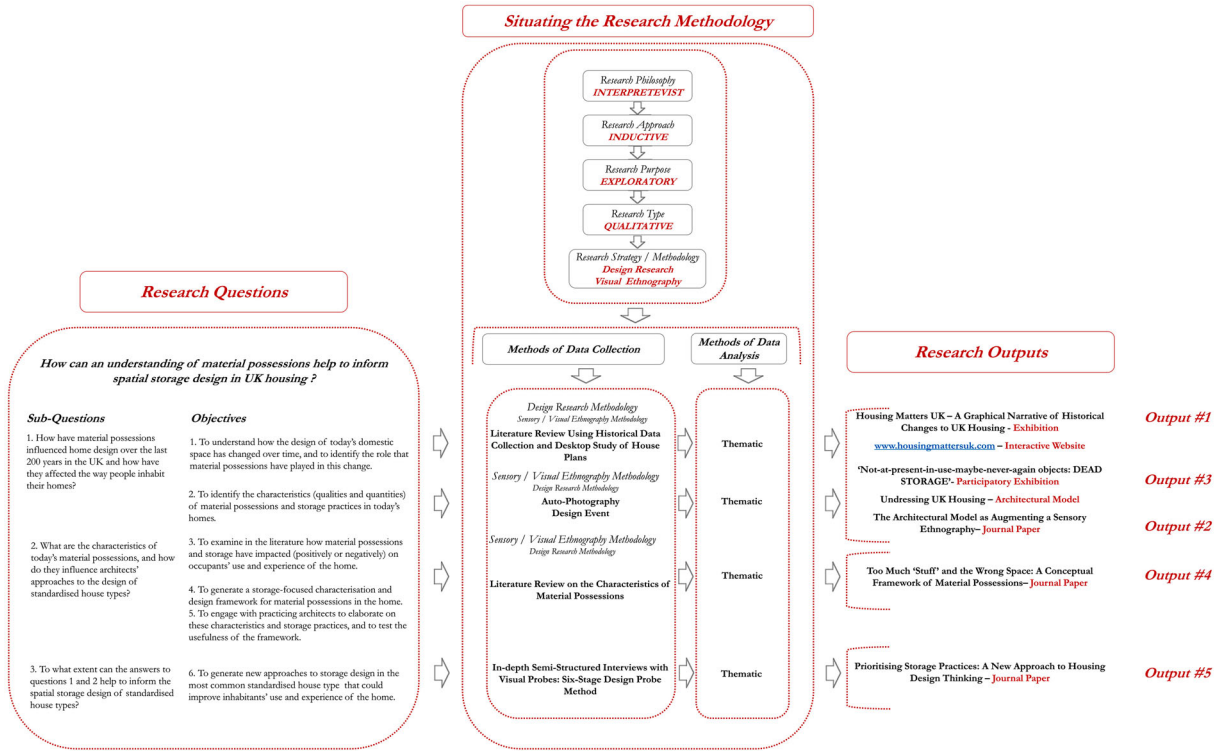
storage for their possessions, as the space has been reallocated to more marketable rooms.¹⁹ Partly as a result of smaller homes, material possessions can overwhelm domestic spaces and affect the inhabitants' well-being, physical and mental health, security, and comfort.²⁰ Stress, insomnia, and low mood are some of the consequences of spaces being overloaded with *stuff*.²¹ The accumulation of material possessions is having an impact on the physical space of the house and on space for storage.²²

This research presents a critical commentary that addresses the lack of consideration of material possessions (or 'stuff') when designing homes. By better understanding the nature of stuff and space in UK houses, houses can be better designed. It describes the research context in which the study is situated, identifies the research question, and shows the overarching methodology used in the study. It then briefly outlines the diverse set of outputs that have been synthesised into the body of work presented here, showing the evolution of an enquiry into the relationship between material possessions and housing design. The outputs from this study (e.g. drawings, physical models, a website, two exhibitions, and interactive artefacts), which have been exhibited or published elsewhere, explore in greater depth changes in domestic space over time and identify the key role that material possessions have played in how people inhabit their homes. A significant body of research has been carried out on the acquisition of material possessions and the associated consumerism practices, as well as on the values and meanings associated with material possessions.²³ Whilst the literature shows some categorisations in relation to the value placed on a possession at a specific time that might make it be displayed or hidden away, until now, there has not been a conceptualisation of material possessions that could be of use to those involved in housing design. A key ambition of this study has been to identify whether a better understanding of material possessions can help inform housing design thinking. To achieve this, new evidence was gathered on people's current use of space and, more importantly, on how architects approach the spatial design of the home and its associated storage practices, especially in the smallest units: the standardised house types.

Research gap

There has been very little academic research in the field of architecture on how the growth in material possessions is impacting on living space in the home. Stuff that inhabitants own is also largely overlooked in current debates on housing policy and design. The location (of storage) of these growing possessions has been overlooked in the literature not only in consumption theory research but also, perhaps more importantly, in design best-practice guidelines.²⁴ Malcolm Morgan and Heather Cruickshank also identified a lack of research on what is a suitable size for a house or specific room.²⁵

This study explores the historical changes in domestic space and identifies the role that material possessions have played in how people inhabit their homes; themes have been framed to inform current spatial housing design thinking. It



also examines literature across different academic disciplines to identify universal characteristics (qualities) and categories (set of shared qualities) of material possessions to be used in housing design. This enables a conceptualisation of material possessions, generating a storage-focused characterisation and design framework for material possessions in the home. The research explores how houses are currently designed, tests the framework, and investigates ways in which houses can be better designed to consider the impact of these evolving material possessions. As the study evolves, the focus of the research is narrowed down to focus on the smallest housing units, the standardised house types, to understand how the limited space they have available can be designed to ensure better storage provision.

In order to be able to address the research gaps identified in the literature, the overarching research question of this study is:

How can an understanding of material possessions help to inform spatial storage design in UK housing?

The overall study is based on publications, artefacts, and visual research outputs, woven together to constitute the research presented in this paper. These have been visually summarised (Fig. 2) to show the overall research question in context, with its sub-questions and objectives, as well as the data collection and analysis methods used, so the reader can easily understand how each

Figure 2. The design of the study, drawn by the author, 2020

output answers each sub-question, and how the overall research question is finally answered.

Methodological approach

The methodological approach used a qualitative multi-method research strategy that has a dominant design research methodology with a supporting visual and sensory ethnography. Both are explorative and reflexive as well as iterative and dynamic and involve the creation of architectural visual probes that are used to enact dialogues or interactions throughout the project, creating what the author refers to as a 'visual ethnography of the design process'. The study used four methods of data collection: literature review; participatory action research (exhibition and design event); auto-photography; and a bespoke six-stage design-probe with semi-structured interviews and an embedded design event. The methods of data collection required four thematic analyses, each carried out in a particular way, appropriate to the research enquiry.

Two literature reviews were carried out. The first focused on historical data collection and included a desktop study to explore changes in the domestic space over the last two hundred years and to identify the role that material possessions played in this change. The literature included historical housing manuals, governmental documents and acts, historical publications from professional bodies, and historical grey literature, as well as historical encyclopaedia and key websites such as that of The Design Museum. The historical data collected was substantial and diverse, and a tailored approach was developed to identify themes over time.

A second, more contemporary literature review was then conducted to enable the identification of the characteristics of material possessions and to explore how material possessions and storage have impacted (positively or negatively) on occupants' use and experience of the home. This literature review identified key characteristics and categories of material possessions relevant to housing design, which were then theoretically conceptualised into a framework of material possessions to be used in housing design, creating a new way of interpreting the data. The review primarily drew from three core disciplines: sociology, anthropology, and consumer research (including material culture). Other fields, such as marketing theory, psychology, architecture, planning, and housing studies were also included as part of the literature review; however, there were far fewer studies in these areas, and those that addressed material possessions tended to focus on particular users, spaces, or cultures.²⁶

To strengthen the findings from the contemporary literature review, the study also used auto-photography techniques to develop an interactive participatory exhibition to capture, at a specific moment in time, insights into inhabitants' personal spaces and possessions. This helped triangulate the findings from the previous historical literature review. A reflective design event then tested the effectiveness of the methodology, using a physical model represent-

ing the findings of the historical data collection, desktop study, and the participatory exhibition.

Finally, a visual ethnographic six-stage design-probe method, which embedded semi-structured interviews and a design event with practising architects. The method used carefully constructed diagrams, graphically representing the conceptual framework of material possessions developed from the contemporary literature to test the usefulness of the framework. Practising architects then used the framework to generate approaches to storage design that improve the inhabitants' use and experience of the home.

The next sections present each output that outlines the data collection and research methodologies used, the key findings and importance of the work presented, and their originality and contribution to knowledge. The research finishes with critical reflection on the research process, the limitations of the research and suggestions for further enquiry.

Output #1 housing matters UK: a graphical narrative of historical changes to UK housing

To understand how the design of today's domestic space has changed over time, and identify the role that material possessions have played in this change, a historical data collection of key influences, facts, and events was carried out, so that key influential themes could be identified. Data for this first study was collected through a literature review and a desktop study of historic housing plans. The data was then analysed to identify themes and communicated as timelines and an interactive website (www.housingmattersuk.com) using a design research methodology.

Five key impacts on housing design were identified: Economics and Industrialisation; Health; Legislation & Policy; Society; and Lifestyles & Technology. A further theme, on the changes to domestic space of a terraced house typology, emerged from the desk study, where *generic* types of small, medium, and large houses were developed. The 'generic' house types were also developed as 3D physical models, so that the changes of space over time could be analysed, especially the impact of kitchen and bathroom spaces on the house overall.

The six graphical timelines brought together an original visualisation of the trends within the bigger picture of policy, society, industrialisation, health, the economy, and technological advances that have taken place in UK housing over the last two hundred years (Fig. 3). The visual evolutionary mapping enabled the abstraction of these complex and multi-layered historical changes and helped understand the disconnect between the available storage space and the amount of possessions that a household has. Storage revealed itself as reactive to changes in social, economic, technological, and demographic drivers. For example, the Lifestyle & Technology timeline allowed the visualisation of the impact of central heating, plumbing, and openable windows in terms of comfort in the home. This timeline also showed the proliferation of material possessions associated with technical innovations such as the washing machine, the fridge, the dishwasher, the DVD player, the iPad, etc.

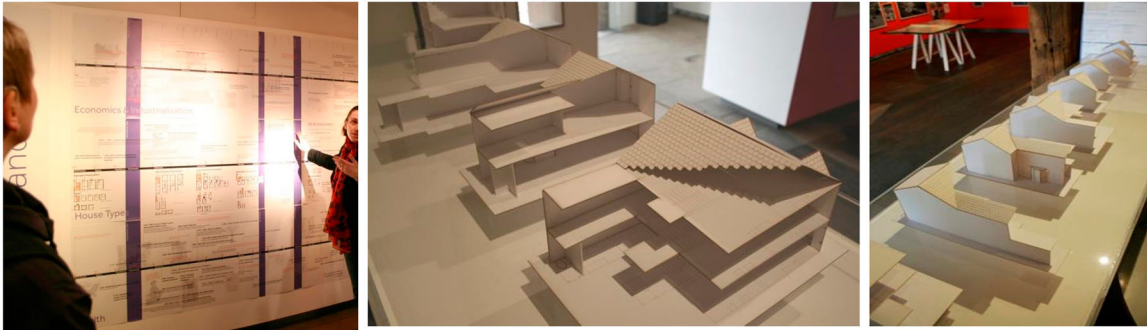


Figure 3.
Timelines being explain during a public tour of the exhibition 'British Housing: Timelines and Types', Architecture Centre, Bristol, photographed by and courtesy of Jodie Marks, 2012

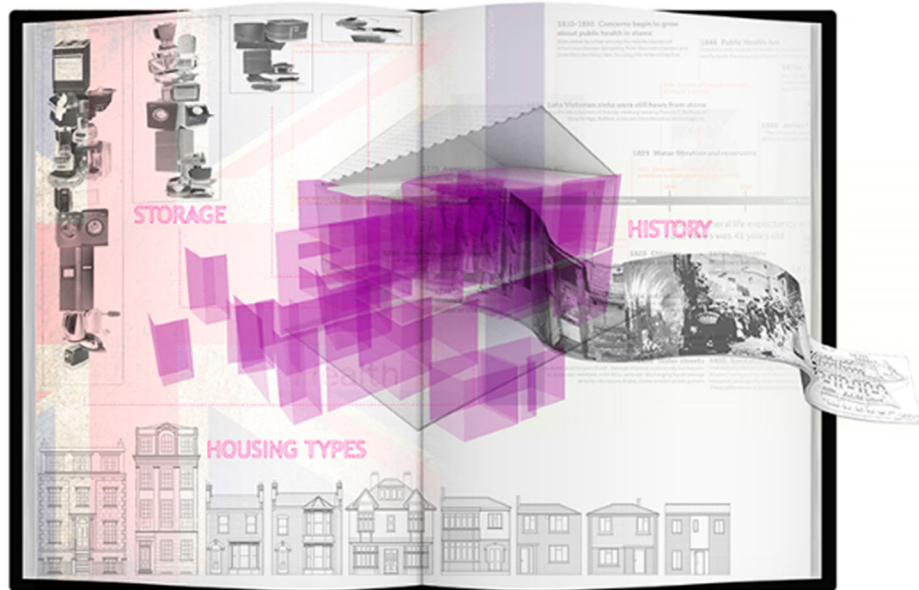
By mapping these diverse historical themes against the 'generic' house plans of the terrace house, a typology that historically tends to be linked with the beginnings of large suburban speculative developments and working-class dwellings,²⁷ the changes to comfort or material possessions associated with the home are visually highlighted, as well as the changes these trends brought to the evolution of the physical domestic space over time.

Whilst the diagrammatic plans of the two-, three-, and four-bedroom terraced houses (small-, medium-, and large-size dwellings) showed the changes to the physical space of the home, a series of 3D physical scale-models of these 'generic' houses were created to capture the historical changes to the layouts, construction, and the impact of standards (if any) over time.

Being able to analyse, abstract, and synthesise very complex and multi-layered information from the historical literature and desktop study, and being able to succinctly communicate this information visually through the graphical timelines (design research), enabled the historical dimension of the evolution of domestic space over the last two hundred years to be captured. However, these graphical timelines and interactive website (Fig. 4) were unable to capture the present-day reality of the way everyday possessions are impacting the use and experience of the home. The next output sought to unveil a new perspective on the ordinary by addressing this gap.

Output #2 not-at-present-in-use-maybe-never-again objects: dead storage

The next stage of the study sought an understanding of how everyday material possessions currently impact the way we inhabit our homes. A participatory public exhibition, titled '*Not-at-present-in-use-maybe-never-again Objects: DEAD STORAGE*', was designed to engage the general public and capture the ways in which inhabitants' everyday possessions are at present impacting the use and experience of the home. The exhibition used an auto-photography data collection method, alongside a participatory event method (the exhibition itself), which was then analysed using thematic analysis, as part of the visual and sensory ethnography with a supporting design research.



The public exhibition was, in itself, a participatory design event, where the final shape and content of the exhibition was unknown to the researcher at the beginning. Initially, the exhibition started with forty-eight photographs taken by members of the public of their material possessions, displayed or stored. During the seven weeks of the exhibition, two-hundred and thirty-four additional photographs were collected from visitors, of which one-hundred and seventy-two were exhibited from one-hundred and seven participants (Fig. 5). Photographs became the mechanism by which both the researcher and the participants glimpsed, during a particular moment in time, how possessions were impacting the physical space of the home.

To the author's knowledge, this was the first-time that a participatory event with the general public (the inhabitants) had been used to gather this type of information. The photographic evidence captured during the event reinforced the disconnect, already identified through the graphical timelines (Output #2), between storage space and the amount of material possessions that a household contains. The design event brought a new perspective on the ordinary by using photographs of material possessions that are normally hidden from the

Figure 4.
Homepage of www.housingmattersuk.com, designed by the author, 2014

Figure 5.
The participatory public exhibition
'Not-at-present-in-use-maybe-never-again Objects: DEAD STORAGE', Architecture Centre, Bristol, photographed by the author, 2014



public and only seen by those who are part of the household or invited to enter as guests.

Most studies in the literature focused on material possessions located in specific areas of the house, such as the garage, open-plan areas, and the kitchen, whereas this study looked at the totality of the home.²⁸ This continu-



ously changing participatory public exhibition systematically presented the growing collection of photographs of 'stuff' that people have in their homes. The exhibition conveyed a glimpse to a domestic reality, where the home is portrayed as a *container* and the household contents, the *stuff*, as the *contained*. The domestic reality of today's houses was unveiled, allowing the identification of how material possessions and storage practices have impacted (positively or negatively) on the use and experience of the home. For example, some of the photographs showed special and valuable personal collections that people wanted to show or display for others to see (Fig. 6). Other photographs showed rooms, especially garages, under-stairs cupboards, and attics, inundated with material possessions that were no longer used (Fig. 7). The inhabitants participating in this exhibition had to make a conscious decision of what to share with the public, meaning that the participant was not an objective recorder, but a subjective one.

The photographs became the architectural tool through which the participants expressed their perceptions of the everyday collections of 'stuff' and how they were impacting the physical space of their homes. The participatory exhibition itself became a *place-event*, where the research narrative was augmented

Figure 6.
Material possessions on display,
photographed by research
participants, 2014



Figure 7.
Material possessions that are rarely shown, photographed by research participants, 2014

through an 'ethnographic representation', where 'ethnographic learning' was gained.²⁹ The general public, photographer and participant, became the protagonists, who helped reveal the hidden reality of the architectural space of the home. This continuously changing interactive design event enabled the identification of six concrete categories of 'stuff' in the totality of the home. These categories were: material possessions associated with specific rooms and spaces; those hidden away or displayed; those associated with cycles of use; those related to a specific point in the life of inhabitants; those related to maintenance and repair; and archival possessions. It also gave an insight into where people keep their stuff, and the extent to which material possessions were taking over the spaces in rooms, thereby adding to the body of knowledge on housing design.

Output #3 undressing UK housing

An architectural model titled '*Undressing UK Housing*' was constructed to display the changes to domestic space over time in relation to the accumulation

of material possessions and to articulate what lies behind the public face of the desired house through time. The model used the data collected from the literature review and exhibition (Output #2 and Output #3). The creation of the model itself used a design research methodology, and the finished model was also used to test and refine the visual and sensory ethnography methodology and to explore its appropriateness for the remainder of the research (Fig. 8). The representation of design thinking as part of the making of architecture is the most important operation that articulates theory and practice.³⁰ The model is the medium by which *certain relevant characteristics of the observed reality* are enhanced and abstracted.³¹ When creating the model, it was necessary to be highly selective of the information that it contained.³² It is left to the maker, in this case, the author, to identify the relevant features for abstraction.

The model takes the form of the four most common UK terraced typologies: the Regency, Edwardian, Victorian, and the Modern house. Each period was deconstructed into twelve layers, each made of 5mm thick laser-cut acrylic, with each layer divided into two halves: left and right (Fig. 9). One-half of each layer was carefully laser-etched to represent the past. The other half was collaged, using images from catalogues and magazines printed onto acetate and glued onto the acrylic, to represent a more contemporary domestic space (Fig. 10). These carefully constructed collages used the findings from the analysis of the photographs collected through the participatory exhibition (Output #2). The past (etching) and the present (collage) cohabit the architectural model to illustrate their influence on today's domestic spaces. Colourful contemporary collages collide with ghostly etched acrylic to communicate a reality of the everyday at a given point in time. The multiple layers that make up the model give an overview across time and space, with the static physical framework of each period home contrasting with the dynamic array of objects and activities that they contain.

The model was used to refine and test the methodology of the study through a reflective dialogue event with five key field experts. The reflective participatory event was designed following a visual and sensory ethnographic methodology to gain 'ethnographic learning' that placed the model, the architectural probe, in a kitchen, the *place-event* (Fig. 8).³³ The kitchen became the domestic context of the *sensory home* that instigated a conversation that strengthened the dichotomy between the reality of space (the kitchen) and its abstraction (the architectural model).³⁴ The field experts became the inhabitants of homes themselves and, as part of this conversation, reflected on their own home experiences, bringing another rich dimension into the analysis of the research. The event also allowed the effectiveness of the reflective, exploratory, experimental, and experiential visual and sensory ethnographic approach to be tested, and helped determine how the approach should be used in the next stage of the research. The dichotomy between the 'perfect architectural model' and the *imperfect reality* was a theme that emerged during the dialogue, especially within architecture and architectural-photography contexts. When architecture is photographed, people and stuff are usually removed, but as one participant stated, 'the house is brought to life when you



Figure 8.
The architectural probe (model) in a
place event (kitchen),
photographed by the author, 2018

add these things'. The participants debated whether the model was *too legitimate*, by which they meant too perfect or crafted. They concluded that the research needed an *illegitimate model* (or probe) that rebukes architectural space.

The architectural model allowed an exploration of its effectiveness as a means of implementing a sensory and visual ethnography research methodology.³⁵ The model helped to synthesise information from disparate sources



Figure 9.
'Undressing UK Housing',
photographed by research
participant, 2017

and provided a visual representation of that information. It also tested the research methodology through a reflective dialogue event that identified which types of architectural design probes would benefit the research and highlighted the importance of creating a *taxonomy of stuff*. However, the size, fragility, and beauty of the final model led to the researcher deciding that this was not the right architectural probe.

The idea of using architectural tools such as models and collages was a beneficial way of continually updating and archiving the findings of the research. Since the research was about the accumulation and storage of material possessions, it seemed particularly apt to use an architectural model as a way of accumulating and storing the research findings. Not only did this allow the progression of the research to be visually recorded (design research), but the very act of creating the model required the researcher to process and rationalise the findings through critical reflection. From the reflective dialogue that took place, both the model and the collages were viewed as carefully constructed spaces that record and store the progress of the research, showcasing how the project had developed, and communicating the research findings so far, in an abstract way.

Output #4 too much 'stuff' and the wrong space: a conceptual framework of material possessions

Building on the importance of developing a 'taxonomy of stuff', the next stage of research focused on the development of a conceptual framework of material



Figure 10.
Example of the fabricated collages
created from the collected
photographs, 2017

possessions³⁶ that would be capable of identifying their universal characteristics and categories and be used to consider the space in the home that possessions might require.

The research used a literature review as its main data collection method as part of both design research and sensory and visual ethnography methodologies. For the first time in the field of architecture, literature from the sociological, anthropological, and consumer research fields was brought together to develop a new conceptual framework for housing design and address material possessions.³⁷ The architectural research field lacks the detailed information that this framework provides. By abstracting, conceptualising, and synthesising a complex set of literature, characteristics and categories were identified specifically for architectural design, with the practitioner-researcher playing a central analytical role in their selection. The information was translated into four visual architectural diagrams: the value probe, the temporal probe, the visibility probe, and the strategies-for-storage probe. Together, they became the *architectural probes* used in the final stage of the research to stimulate new housing design approaches for practitioners, focused on storage for material possessions.

This conceptual framework of material possessions identified value, temporality, and visibility as core characteristics. They drove the categorisation of material possessions into utilitarian and pleasurable possessions, or possessions that shape the inner – and/or external-self. While the utilitarian and pleasurable possessions are part of short-, medium-, or long-term cycles (frequency), material possessions related to identity are more sensitive to unidirectional flows of time, as ‘life flows’, ‘emotional flows’, or ‘lifestyles flows’ (Fig. 11). Finally, depending on the sentimental, financial, or aspirational value placed

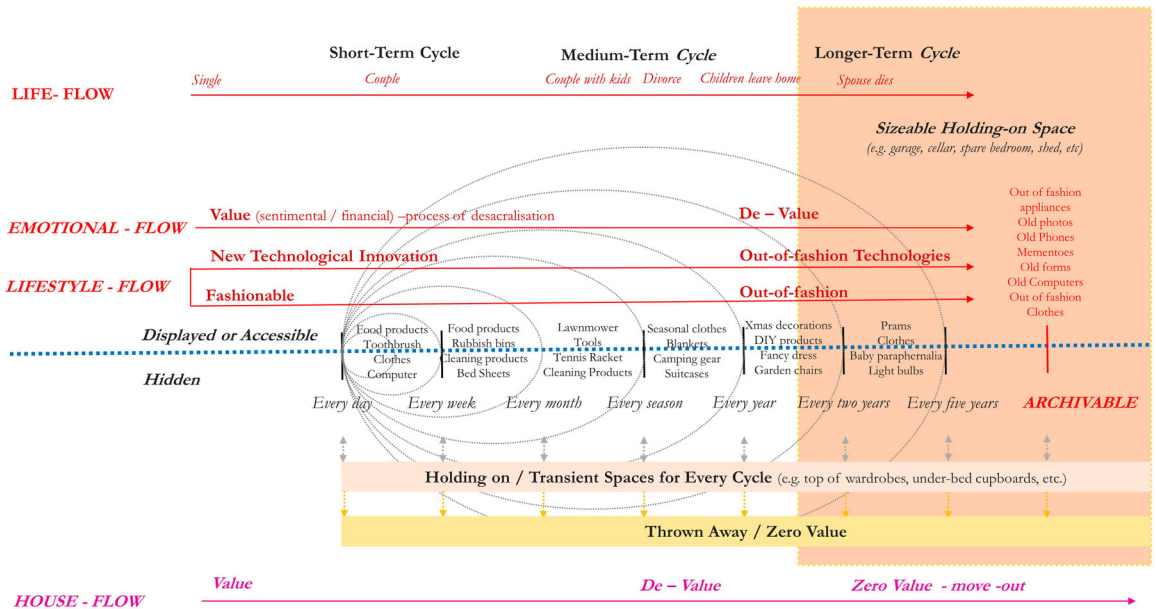


Figure 11. Diagram showing two of the characteristics of material possessions identified from the literature: 'frequency' and 'visibility', drawn by the author, 2017

on the material themselves by the inhabitants, some items will be visible to themselves and others, and some will be hidden away from view. Strategies for the design of storage, at room – and house-level, were also articulated.

Space for living in new build houses in the UK is at a premium and households have more material possessions (or 'stuff') than ever before. The way in which this 'stuff' is accommodated in dwellings can significantly affect residents' quality of life and well-being. The impact of material possessions on the physical space of the home, as well as the location of storage for these material possessions, is presented as a new perspective for consideration in the housing debate.

The study placed value on the design of storage within the limited space of today's houses in order to propose an alternative approach to housing design thinking that provides adequate spaces for the inhabitants and their associated material possessions. These possessions define the inhabitants' values and self-identity and affect their well-being, comfort, and happiness. Therefore, it is argued that storage practices should be brought to the forefront of housing design thinking. By including storage in the designers' agenda, architects can begin to consider material possessions related to the inner – and external-self, so the design of houses can truly facilitate the inhabitant's lives and lifestyles: a perspective that until now has not been considered in published design guides.

This study stimulated new housing design approaches, focused on storage for material possessions related to activities, inner – or external-self, either at room – or house-level. It argued that the conceptual framework could help designers, policy makers, and house builders to better understand the nature

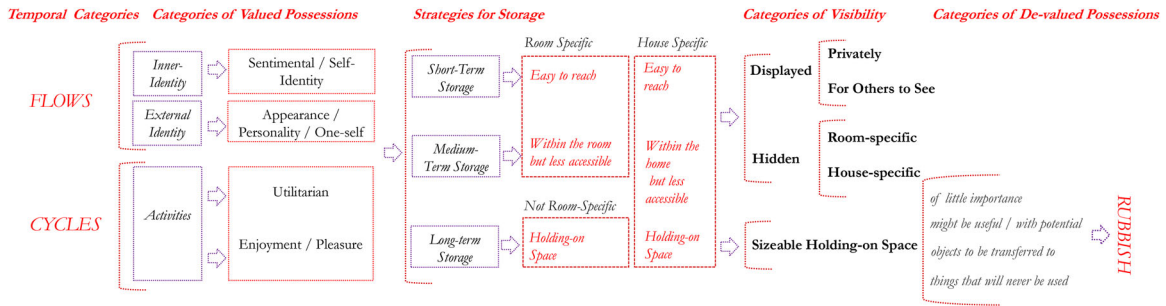


Figure 12. A conceptual framework of material possessions, drawn by the author, 2017

of material possessions and suggested a way in which possessions could be better accommodated in contemporary homes. Considering space for storage in the design of new houses could help householders avoid cluttering the space, and therefore impact positively on their quality of life and well-being.

The conceptual framework presented here (Fig. 12) also begins to address the weakening functionality of the new houses that are currently being built, at a time when the delivery of new housing is a priority. It also validated the six concrete categories of ‘stuff’ that had been identified in Output #3.

Output #5 prioritising storage practices: a new approach to housing design thinking

This final stage of the study took the form of discussions and a design intervention with 17 practising architects that worked with house builders.³⁸ The sample of architects ranged from small, medium, and large architectural practices and represented a range of positions, so that an array of perspectives was captured. Initially, the discussion identified ways in which architects approach the design of standardised house types and examined whether the design of storage is considered at all, and if so, how (in the present). The study employed a visual architectural design probe data collection method, using four carefully designed diagrams (value, temporal, visibility, and a storage strategy informed by Output #4). Using a dominant visual and sensory ethnography research methodology, the probes (design research) were then used to explore how storage practices could be better incorporated when designing new homes (in the future).

Methodologically, the visual design probes were used to stimulate dialog and a design thinking amongst the practising architects from the perspective of storage practices for material possessions. By exploring new approaches to housing design thinking from a storage perspective, the architects were able to propose designs that support the inhabitants’ lives and lifestyles, and, therefore, their well-being.

In the subject domain, the findings of the study show that a consideration of storage and its associated practices is vital for good housing design. In order for new models of housing to emerge that consider inhabitants' material possessions, space for storage needs to be valued and not seen simply as residual, left-over space. In current housing design, space for storage has been eroded to accommodate the ever-increasing number of *must have* rooms. Rooms currently add financial value to a house, whilst space for living and storage does not. When the study participants were asked to design for storage, their approach was sometimes to do so in a way that created a valued 'room' in the form of a 'wall of storage' or a 'central house storage'. Some participants also tried to bring back traditional residual spaces like the 'loft' or the 'under stairs cupboard'. This meant that the storage became a valued dedicated space in itself, one that could be costed-in and marketed by the developers. Creating a valued room that is seen as a 'must have' so it sells was seen as a way to challenge the static developers' portfolios.

Some of the innovative approaches to housing design provided by the participants challenged the idea of *must have* rooms. They were driven by flexibility and adaptability, as well as inhabitant's house profiles. Flexibility became the critical design dimension that could be generalised, and this finding reinforced previous studies.³⁹ For example, the idea of an 'expandable and contractible attic space' was explored by two participants to accommodate long-term possessions. The idea of a 'blanket house' also emerged that not only considered internal but also external (e.g. bikes, bins, garden tools, maintenance tools, etc.) storage, indicating the importance of a *layered* approach to storage, where external storage was as valued as internal. The architects suggested that storage needs to be a valuable space and to become more glamorous, inspirational, and experiential.

For the first time, this study brought storage practices to the centre of standardised housing design. By using a new approach to housing design thinking, in the form of a conceptual framework of material possessions as an architectural design probe, practising architects were engaged in a design intervention to explore how to design for storage when space is at a premium.

The strength of the study lies in bringing together two widely acknowledged problems: the housing crisis and the growing preoccupation with the acquisition of material possessions. The study also brought a new unexplored dimension to design practice research and housing policy debates. It went beyond providing space for living and considered the impact that material possessions have on the physical space of the home, supporting residents' lives, lifestyles, values, and well-being.

The exploratory nature of the study sought new design insights by using an innovative design method of visual probes with practising architects. The development of the six stages of the ethnographic method followed the approach proposed by Jayne Wallace and others.⁴⁰ However, instead of being used with participants that have gone through a lived experience (in this context, it would have been the inhabitants), it was used with the architects themselves (the professionals that need to understand the inhabitants) to enact a much

Conclusions

The research study, presented through the five outputs, has ambitiously and creatively explored ways in which UK houses can be better designed by better understanding the nature of 'stuff' and space. Across the whole study, architectural tools (diagrams, collages, models, photographs, timelines, mind-maps, etc.) are used as 'ethnographic records' to evaluate, correct, and re-evaluate the research process in itself.⁴²

Output #1 captured the historical evolution of domestic space over time (the past), Output #2 brought a new perspective on the ordinary by exposing the impact that material possessions are having on today's houses (the present). Output #3 enabled a re-evaluation of the methodological research approach and identification of the next 'architectural probe' to be used in a focused design intervention. This is done via the four diagrams in Output #4 capturing the conceptual framework of material possessions. The strength of Output #5 lay in bringing together two widely acknowledged issues, the housing problem and the growing preoccupation with the acquisition of material possessions, to be explored in a design event with architects.

The research combined two explorative methodologies, design research, and visual and sensory ethnography to capture *the visual ethnography of a design process* with practising architects, so an issue raised in practice, but relatively unexplored academically, could be approached from a novel perspective. The author understands that the methodological approach presented in this study could be seen to have limitations due to its lack of replicability and generalisability. This is particularly true of the participatory events with visual probes, as they were specific to this study.⁴³ However, the explorative and reflective nature of these events was seen as a strength. They were designed to inspire new ways of thinking, collect complex information, and help see the housing problem from a different and unexplored perspective that can benefit both architectural practice and research. Despite being difficult to replicate, the methodological approach presented in this study can still be useful to other researchers if used as a framework for exploratory research that needs to consider complex and multi-layered design problems from different and unchallenged perspectives.

The findings brought a new unexplored dimension to design practice research and housing policy debate, which is that of going beyond providing space for living and considering the impact that material possessions have in the physical space of the home in supporting the resident's lives and lifestyles, and, therefore, their well-being. The resulting design proposals show that by better understanding the nature of material possessions and their impact on space, better housing models can emerge.

The study identified the disconnect between the available storage space in the home and the amount of material possessions that a household contains. Unlike previous studies, which have been more focused on material possessions related to specific areas of the house, such as the garage, open plan areas, or the kitchen, this study covered the totality of the home.⁴⁴

Through a participatory exhibition, it identified from inhabitants six-core categories of material possessions: those associated with specific rooms and spaces; those hidden away or displayed; those associated with cycles of use; those related to specific points in the life of inhabitants; those related to maintenance and repair; and those which are archival possessions. These categories give an insight into where inhabitants keep their 'stuff' and the extent to which material possessions impact on the physical space of the home. The study also revealed the material possessions that inhabitants own, and where they are located in the home. This exposed spaces in the home that are hidden, messy, and never seen by invited guests, and, in contrast, showcased spaces that are displayed, carefully composed, and exhibited for other household members or invited guests to see.

The study demonstrated that the space for storage has been eroded, almost forgotten, to accommodate the ever-increasing number of *must-have* rooms that reduce the flexibility of developers' schemes and amount of overall storage space. To address this, it stimulated new housing design approaches focused on storage for material possessions related to activities, inner – or external – self, either at room – or house – level. This study has also shown that, by considering the characteristics of space and possessions, the inhabitant's lives and lifestyles can be better supported, which will have a positive impact on their health and well-being.

This study proposed *common sense* design responses that bring back flexibility within a standard typology. It showed how designing for storage can create a valued *room* in the form of a 'wall of storage' or a 'central house storage' as a way to challenge the static developers' portfolios. By allowing storage to become a valued dedicated space in itself, it can be costed-in and marketed by the developers. However, this study advocates achieving this flexibility whilst maintaining current standardised house sizes but exploring the reduction in number of these *must have* rooms. This is a key message for both practitioners and policy makers, as the viability and affordability of housing is an important factor that cannot be ignored.

The current developers' housing portfolios are static and there is a need for new and appropriate housing models. These new models can address the health implications, such as stress, low mood and insomnia that have been associated with the accumulation of material possessions and insufficient space to store them.⁴⁵ By challenging the current developer's portfolios, this study also builds on the work of Rob Imrie, who argues that current models do not meet the needs of vulnerable groups such as disabled people.⁴⁶

Finally, the way houses are currently sold, based on the number of rooms instead of floor space, needs to change, so that space for living and storing possessions become valued. This would have notable implications for housing policy and the current property marketing approach, as it would require residents be more informed and with a better understanding of what they will need at different points in their lives, depending on their lifestyles.

The study has become even more relevant in the aftermath of the global pandemic. With a move towards increased home working and the every-present

spectre of future lockdowns, it is now more important than ever that housing policy makers, practitioners, and architectural researchers acknowledge the relationship between material possessions and housing design, as well as exploring the aftereffects of the pandemic in housing.⁴⁷ Storage needs to be valued and flexibility must be the default, so that new models of housing can emerge that address the well-being and health implications associated with the cluttering of space. These new models cannot ignore the viability and affordability of housing, especially when considering the smallest units, the standardised house types. But neither can they ignore the needs and well-being of the inhabitants themselves.

Acknowledgements

The author would like to thank Professor Katie Williams, Professor Danielle Sinnott, Professor Sonja Oliveira, and Dr Paul Shepherd for their valuable input into the research reported in this paper.

Disclosure statement

No potential conflict of interest was reported by the author.

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