



Housing adaptability: new research, emerging practices and challenges

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SPECIAL COLLECTION:
HOUSING ADAPTABILITY

EDITORIAL

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ABSTRACT

HIGHLIGHTS

The underlying issues of why housing adaptability is important today are introduced, together with the drivers and barriers to uptake. This editorial explains the different kinds of adaptability (environmental, spatial, social and multi-use(r)) and how they can be achieved. The themes and individual papers in this special issue are discussed, together with their individual, community and societal importance. The global pandemic highlighted the realities of achieving incremental spatial adaptations, but also the attitudinal changes enabling temporary ‘choreographing’ of different social uses of spaces. New methods for investigating housing adaptability are also highlighted to better understand occupants’ needs and to demonstrate how adaptability adds value to occupants. Residents have an active role in undertaking temporal adaptations. However, this depends on provisions made by clients, developers, designers and managers involving the layout, design and multifunctional uses of space. This includes making outdoor spaces more adaptable and developing scenarios that allow dwellings to accommodate changes over time (daily, seasonally and over life-course cycles). Adaptable approaches rely on careful planning and design of room layouts (and the services that support them) to enable connection between rooms and different uses of rooms without restriction of use by residents. Housing adaptability should be based on inclusivity and equity.

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1. INTRODUCTION

Climate change mitigation is well researched in terms of retrofitting the existing housing stock. However, the questions surrounding the adaptation and flexibility of our homes have been less considered. It is this surprising gap in our collective knowledge across these different aspects that prompted the topic for this special issue.

The majority of people now live in urban areas, and this is expected to increase to two-thirds globally by 2050 (UN 2018). Many citizens live in urban apartment blocks they did not design themselves (Saarimaa & Pelsmakers 2020), and current housing is designed to tighter space standards (Park 2019; Tunstall 2015) and with specific room types that create 'tight-fit' spaces that cannot be used for much else than the function they were designed to fulfil (Rabeneck *et al.* 1973). The need for housing adaptability (*i.e.* enabling different social uses; Groak 1992) and flexibility (*i.e.* enabling different physical changes; Groak 1992) became apparent during the pandemic when an increasing range of activities, such as working, studying, home-schooling, exercising, *etc.* occurred in homes that were never designed for this purpose and thus ill-suited (NHF 2020; Lehtinen *et al.* 2022). However, the need for adaptability and flexibility is also necessary at other times during a building's lifespan. For example, dwellings need to accommodate new working practices promoted by digitisation, or a changing demographic (an ageing population, migration, the diversification of household structures) (Pelsmakers *et al.* 2021; Lehtinen *et al.* 2022). This highlights questions about how to best adapt spaces to accommodate different and changing user needs and user generations (Femenias & Geromel 2019; Holliss 2017; Saarimaa & Pelsmakers 2020).

A limited adaptability can have negative social consequences. It can reduce long-term diversity of inhabitants by forcing residents to move home instead of staying in the same community where they have social bonds (Lee & Park 2010; Femenias & Geromel 2019; Luoma-Halkola *et al.* 2019). Adaptable and flexible spaces are important for supporting ageing in place. This capability also enables residents to create the right-sized homes for working or schooling from home and supports changing family constellations (*e.g.* multi-generational and extended families, fluctuating family sizes, *i.e.* children who move between different homes) (Pelsmakers *et al.* 2021). Long-term residency supports community cohesion through established social networks, which in turn increases life satisfaction, wellbeing and human health (Lee & Park 2010; Klinenberg 1999).

Adaptable and flexible spaces and buildings are an essential part of circular construction. This enables buildings to have longer lives and avoids premature building demolition (Huuhka & Vestergaard 2019). Demolition is costly not only economically but also socially and environmentally (Pelsmakers *et al.* 2020; Schneider & Till 2005).

An emphasis on longevity will entail buildings that are adaptable to different user needs, but also respond to the changing climate to remain fit for purpose and protect occupants' health and wellbeing (Pelsmakers *et al.* 2020). A small additional initial investment in adaptability maximises the building's value throughout its life (Rabeneck 2021; Schmidt & Austin 2016), even when incorporating a degree of additional capacity. Adaptations also depend on residents' desire and ability to invest in their homes. However, evidence on how much residents may be prepared to pay for such future flexibility in their homes is scant and scattered.

1.1 WHERE HAVE WE COME FROM?

Premature obsolescence of housing was widely observed after the 1970s' oil crisis in the UK, with compromised space standards, poor quality and energy inefficiency, leading to early demolition of housing estates (Rabeneck 2021). This renewed an interest in flexibility (Rabeneck 2021), although experimental housing since the 1950s had explored the ability to adjust living spaces in order to respond to changing household needs (*e.g.* fluctuating size of households):

The apartments in the helicoidal building will be shaped like slices of cake. One will be able to enlarge or reduce them by shifting moveable partitions. The half floor gradations avoid limiting the number of rooms, since the tenant can request the use of the adjacent

section on either upper or lower levels. With this set up three four-room apartments can be transformed into one twelve-room apartment in less than six hours.

(Debord 1956/2006: 65)

This ambitious vision had technical, legal and managerial as well as design implications. However, built examples remained rare and exceptional.

The discourse around housing adaptability and flexibility stretches back at least 70 years, in response to ‘tight-fit’, inflexible modernist housing design (Schneider & Till 2005). The discourse contains a confusingly divergent set of terms and definitions; adaptability has been referred to as ‘multi-usability’, ‘multi-functionality’ or ‘polyvalence’, expressing a diversity of uses, while flexibility (which often relies on technical solutions) is referred to as ‘transformability’, ‘convertibility’, ‘modifiability’, expressing physical changes (Saarimaa & Pelsmakers 2020; Tarpio 2015).

Compared with flexible approaches, adaptable approaches rely more on careful planning and design of room layouts (and services that support them) to enable connection between rooms and different uses of rooms without restriction of use by residents (no built-in furniture, abundant servicing, generic specification, careful window and door placement, etc.) (Rabeneck 2021). Habraken (1972, 1998) advocated the ‘Open Building’ concept using terms of ‘support’ and ‘infill’ to differentiate between those shorter/longer lifespan aspects occupants can/cannot adapt (short life interior ‘infill’ is alterable, similar to Brand’s 1994 ‘stuff’ and ‘space plan’ layers of change). ‘Support’ covers aspects that residents typically cannot change, usually the exterior, the building’s structure and fixed services (though connections to them may be able to be altered). This equates to Brand’s ‘structure’, ‘skin’ and ‘services’ layers. The design of ‘support’ can make it easier or hinder ‘infill’ changes by residents, e.g. where window configuration facilitates room division or constrains furnishability (Saarimaa & Pelsmakers 2020).

1.2 DEFINING ADAPTABLE HOUSING

A spectrum of alterability exists: from do-it-yourself (DIY) or self-building to incremental housing (Aravena & Lacobelli 2012). Schmidt & Austin (2016) propose the broader concept of adaptability as the ability of a building to be passively or actively adjusted to new situations. Adaptability and flexibility can also vary according to time, e.g. this may occur at various times during the day (different day-night uses), week (week-weekend) or changes during the year (e.g. based on seasonality) (Pelsmakers *et al.* 2020).

In the 1970s, Rabeneck *et al.* (1973, 1974) investigated 30 projects from across Europe with different approaches to housing flexibility enabling adaptations to changing life situations, e.g. dismantlable partitions, future expansion and user-driven layout planning. These approaches were costed: 26% additional cost for ‘full flexibility’ and 6% extra cost for ‘build on’ principles and adaptability based on 10% extra space. The latter slack space provision was a key recommendation (Rabeneck 2021). Taking this range of indicative additional costs, a building’s asset value may depreciate faster and suffer from greater user fluctuation if it is unadaptable (Schneider & Till 2005), though this will be dependent as well on the location and housing market situation.

Despite all these advantages of adaptable and flexible ‘open’ buildings, it is not clear why these principles have not been mainstreamed in housing design and development practices.

1.3 WHY IS THIS STILL IMPORTANT NOW?

Recently housing adaptability has received attention due to additional expectations being placed on homes during the pandemic, but also the increasing understanding of its importance in the creation of a more sustainable society. Adaptability and flexibility of our built environment infrastructures and management practices were found to be fundamental to create a resilient society that can respond to unpredictability; the cost of neglecting this may be too great a price to pay (Chester & Allenby 2019). Moreover, a renewed focus on avoiding building demolition to reduce embodied carbon and resource scarcity as part of carbon neutral approaches have started to make adaptable buildings a part of mainstream discussion in the built environment. Indeed,

despite the principles of ‘long-life, loose-fit, low-energy’ being nearly 50 years old (Gordon 1974, cited in Langston 2014), it is more relevant than ever today.

The increased focus on low capital costs and maximisation of corporate profit margins has led to reduced space provision at the expense of design quality, hindering adaptable and flexible housing materialising at scale (Rabeneck 2021; Pelsmakers *et al.* 2021). This means the number of apartments is often maximised on any single plot, with extended building depths (Saarimaa & Pelsmakers 2020; Tarpio 2020), and apartments that often can only be furnished and used in one way (Saarimaa & Pelsmakers 2020; Lehtinen *et al.* 2022). For developers and architects, the notion of efficient space means providing the minimum area to save on construction costs and maximise the number of units on a site. For inhabitants, efficient space means being able to use space effectively that accommodates their needs over time.

2. CONTRIBUTIONS IN THIS SPECIAL ISSUE

This special issue provides several different perspectives on housing adaptability to address the short- and long-term sustainability and resilience of the existing and new housing stock in different parts of the world. The initial principles of housing adaptability were structured along four key adaptability concepts (environmental, spatial, social and multi-use(r)). However, this special issue led the editors to revise these adaptability themes to acknowledge that housing adaptability is not solely a characteristic of an internal space (*i.e.* in an apartment, or within a building), but also extends to external spaces (*e.g.* balconies) and the connections between internal and external spaces and adaptations in response to environmental conditions (Peters & Masoudinejad, Smektala & Baborska-Narozny). Adaptability can also be achieved through the social practices to use the same space for different purposes (Hipwood, Marco *et al.*, Blanc & Scanlon). Residents have an active role in undertaking temporal adaptations (Peters & Masoudinejad). Multi-user adaptability now includes the need for multi-agencies to be involved to enable housing adaptability (McCall).

A total of 35 abstracts were received in response to a call for papers. Abstracts were carefully selected and papers then underwent a rigorous peer-review process, leading to the publication of eight papers in this special issue (Table 1). The editors looked for research that would investigate adaptability across different scales, overcoming barriers and interconnections between the different adaptability concepts.

Table 1: Articles in this special issue ‘Housing Adaptability’, *Buildings & Cities* (2022), 3(1); guest editors Sofie Pelsmakers & Elnor Warwick.

AUTHORS	TITLE	DOI	TYPES OF ADAPTABILITY COVERED			
			ENVIRON- MENTAL	SPATIAL	SOCIAL	MULTI-USE/ MULTI-USER
S. Pelsmakers & E. Warwick	Housing adaptability: new research, emerging practices and challenges (Editorial)	https://doi.org/10.5334/bc.266	×	×	×	×
F. Blanc & K. Scanlon	Sharing a home under lockdown in London	https://doi.org/10.5334/bc.182		×	×	×
T. Hipwood	Adapting owner-occupied dwellings in the UK: lessons for the future	https://doi.org/10.5334/bc.186	×	×	×	
E. Marco, M. Tahsiri, D. Sinnett & S. Oliveira	Architects’ ‘enforced togetherness’: new design affordances of the home	https://doi.org/10.5334/bc.189	×	×	×	
V. McCall	Inclusive Living: ageing, adaptations and future-proofing home	https://doi.org/10.5334/bc.173		×	×	×
T. Peters & S. Masoudinejad	Balconies as adaptable spaces in apartment housing	https://doi.org/10.5334/bc.191	×	×	×	×
M. Smektala & M. Baborska-Narozny	The use of apartment balconies: context, design and social norm	https://doi.org/10.5334/bc.193	×	×	×	×
J. Tarpio & S. Huuhka	Residents’ views on adaptable housing: a virtual reality-based study	https://doi.org/10.5334/bc.184		×	×	
S. B. Villa, P. B. Vasconcellos, K. C. R. de Bortoli & L. B. de Araujo	Lack of adaptability in Brazilian social housing: impacts on residents	https://doi.org/10.5334/bc.180	×	×	×	

Table 1 also highlights the types of adaptability covered by each paper. All papers were situated in spatial and social adaptability. Half of them in this special issue highlighted that home adaptations, even before the pandemic, were common at different stages of the household life cycle or seasons (e.g. Hipwood, McCall, Peters & Masoudinejad, Smektała & Baborska-Narożny).

2.1 ENVIRONMENTAL ADAPTABILITY

Environmental adaptability involves adaptation to a changing climate, *i.e.* adapting to a future including flooding, hotter weather and to different external environmental conditions or context (wind, rain, sun, noise, pollution, *etc.*). It also includes mitigation (*i.e.* low energy housing retrofits, design for disassembly, *etc.*) and connectivity between the internal and external environments.

There were surprisingly few abstract submissions explicitly exploring aspects related to environmental adaptability. Perhaps this was because there are already numerous studies (specifically from a socio-technical or socio-cultural approach) that emphasise and then centralise the role of occupants in housing retrofits. Of the papers in this special issue, Villa *et al.* observed that the environmental adaptability of social housing in Brazil was generally poor, especially related to internal and external thermal comfort, exacerbated by deforestation. Hipwood touched on the integration of low carbon measures when spatial home adaptations were undertaken (e.g. prompted by the need for working from home). Hipwood examines the motivations for a light-green retrofit, but found homeowners made alterations on the basis of equating energy efficiency with comfort, but they gave limited consideration to carbon or other wider environmental factors (e.g. site-specific issues, summertime overheating).

The pandemic gave the impetus to re-examine the increased significance of access to outside private space in several papers, and the design of homes and sensitive environmental factors such as sunlight and acoustics on wellbeing and quality of life. For example, Peters & Masoudinejad show that adaptable balconies can enable changes to indoor-outdoor connectivity and better apartment functionality. Marco *et al.* also stressed the importance of access to external spaces as part of the home and threshold and marginal spaces (see also Warwick & Lees 2022) and flexibility to incorporate these associated spaces into living areas as a tactic to overcome insufficient space standards. Smektała & Baborska-Narożny noted how the intensity of usage of balconies was a direct response to the external environmental conditions, finding that balconies facing green spaces, trees or more private courtyards were more regularly used than those too exposed. Excessive traffic noise also deterred the use more than a small balcony area. Residents were found to prefer north-facing balconies to avoid overheating. However, supply-end stakeholders prioritise south-facing balconies—exposing a lack of understanding by designers, developers and estate agents of balconies in-use.

2.2 SPATIAL ADAPTABILITY

Spatial adaptability involves adaptability of (internal and external) living environments to support living, working, schooling and socialising from home. This means enabling a diversity of uses over the users' life-course and responding to unpredictable events such as temporary or chronic disability or spread of disease (e.g. simple furniture changes, reallocating room purposes, moving walls or expanding the dwelling).

Unsurprisingly spatial adaptability featured in all the papers; however, the scale of spatial changes was less dramatic or permanent than the prior literature would have led one to expect. In particular, most papers in this special issue focused more on 'tweaks' or adjustments to existing homes rather than serial adaptability potential (*i.e.* adaptations made after one another by the same or different users). Peters & Masoudinejad review several requirements for adaptable balconies, e.g. usability and functionality, convertibility (*i.e.* varying the level of enclosure related to needs and local climate), and how balcony use affects the use and adaptability of the internal spaces. They find that adaptable balconies can support spatial adaptability of the dwelling. For example, an adaptable balcony enables the change of balcony enclosure and the connection to the indoor space, thereby extending the living spaces to the open or enclosed balcony—as desired in different seasons—instead of the balcony simply being a bike storage space or external seating area. It was noticeable how the majority of the studies identified minor, piecemeal modifications to existing homes (e.g.

McCall, Blanc & Scanlon, Marco *et al.*, Smektała & Baborska-Narożny, Villa *et al.*). The changes made by residents were relatively small or temporary, such as rearranging furniture, reconfiguring the use of rooms, occupying marginal spaces, clearing ‘stuff’. Marco *et al.* describe many of these as ‘domestic/housekeeping’ actions. Tarpio & Huuhka describe how a second entrance door can support housing adaptability by simple means (which could lead to significant apartment adjustments by combining or dividing units). Villa *et al.* note that the inadequate small spaces in the observed social housing make it difficult for residents to alter the layouts even in small ways.

A second, slightly more permanent scale of adaptability did involve construction. For example, Hipwood tracks and classifies typical changes to existing homes; those undertaken for maintenance or improvement to energy efficiency to modernise or update living conditions, identifying the familiar list of extensions and loft conversions that were possible within a standard set of housing typologies. Hipwood’s point is to explore the motivations and perceived benefits from making changes. While none of the alterations was radical, they were easily achievable within constraints of planning and budget as well as current fashions for home interiors. Villa *et al.* observe that extensions were typically to enlarge kitchens, though this expansion is not possible in apartments.

2.2.1 Homes across the life course

Homes that could accommodate households expanding or contracting was a common theme highly shaped by the reading of homes as a collective space. Tarpio & Huuhka’s research on the capabilities of different family homes to accommodate life course changes found the provision of spaces enabled the possibility for various degrees of independence and separation. The three papers responding directly to the pandemic (Blanc & Scanlon, Hipwood, Marco *et al.*) all emphasised adjustments to provide occupants with their own territory. As novelist Virginia Woolf noted in her 1929 essay ‘A room of one’s own’: having a room (space) of one’s own to work at home or escape to allowed personal control over what happened within. The significance of these spaces for retreat reinforced the increased significance of home as a safe space.

Preparing for retirement and ageing in place was a distinct subset. Again, the physical modifications identified by McCall are small scale, avoiding disruptive or high-tech solutions, unlike in Hipwood’s research. Housing adaptability is only one means to achieve the primary goal of keeping older people in their homes for longer. McCall highlights the need for a shift from individual responsibility to a public issue, which relates to multi-user adaptability.

2.2.2 Valuing the potential for change

Tarpio & Huuhka explore how housing adaptability in new apartments can add value, beyond the financial cost of rent or purchase. Participants demonstrated the ability to think about possible future scenarios and how helpful this adaptive capacity would be for their day-to-day lives (e.g. the ability to stay in the neighbourhood, meeting different needs as children become more independent or move out, working from home, having family carers, accommodating assistive equipment, providing future financial stability if the apartment can be divided). They also expressed a willingness to pay for potential adaptability over time if the benefits and mechanisms for changing spaces are clearly communicated to them. Consequently, housing markets and rental agreements need to respond to this demand. Developer and clients can allow for this adaptability (e.g. to rent a smaller or a larger part of the unit in future), and need to become more sophisticated in their communication of this potential ‘transformability’ value by explicitly spatialising adaptability.

McCall notes that future-proofing homes to enable ageing in place benefits both the individual occupant and wider society. McCall makes a business case for increased government investment through quantifiable reduced care and hospitalisation costs as well as less tangible community benefits. Marco *et al.* emphasise that architecture practice should consider the need for adaptability, connectivity, individuality and communality as a new reality ‘that demands new design approaches’ in future housing design. Blanc & Scanlon also urge the consideration of new standards for flexibility and varied uses in new-build housing and in existing multiple-occupancy housing (*i.e.* where non-family members share a home), including better dwelling space standards.

2.3 SOCIAL ADAPTABILITY

Not all observed adaptations in the articles were physical alterations: some were about the 'ownership of space'. Social adaptability underpins spatial adaptations and novel housing solutions, including the negotiated shared responsibilities, attitudes, rules and trust that makes new models of living possible (such as co-housing or collective sharing of amenities). It supplements the nuclear family way of living by supporting a diversity of other models, e.g. solo dwellers, multi-generational living, flat-sharers and extended families with fluctuating members over time.

Social adaptability makes a distinction between house/apartment (i.e. the physical space) and the 'home' as a psychological construct that each household member experiences differently (e.g. Marco *et al.*).

Conclusions on social adaptability explored processes of who is responsible for, or has power to make changes, or the negotiations between those sharing (an often over-occupied) home (e.g. Marco *et al.*, McCall, Blanc & Scanlon, Villa *et al.*). Both Blanc & Scanlon and Marco *et al.* showed the extent that Covid altered the dynamics of how much time was spent in a shared home; 'the house was housing the whole outside world' (Marco *et al.*) with all aspects of work and personal life blurring together. Expectations and aspirations for sociability and collective living altered, adaptations needed to change households from 'getting through' to 'getting on' households (Blanc & Scanlon). Their paper also notes that non-family sharers in multiple-occupancy homes live in homes not typically designed for adult sharers and do not benefit from purposely designed common rooms and layouts to enhance a sense of community between sharers, as exist in co-housing.

Other papers note that in the pandemic domestic rules and routines were re-established, shaped by insights that the way spaces were used impacted on social relationships (e.g. Marco *et al.*, Blanc & Scanlon, Hipwood). Hipwood refers to this as the temporary 'choreographing sequences of practices', e.g.:

by adjusting family mealtimes so that the kitchen could be used first as a workspace and then as a family space.

While this is negotiated within the same spaces of the home, this is also somewhat related to the next concept of adaptability.

For social housing at the neighbourhood scale, Villa *et al.* note that the absence of social infrastructure and quality public facilities erodes trust and isolates communities and neighbours, undermining a community's resilience and social adaptive capacity.

2.4 MULTI-USE AND MULTI-USER ADAPTABILITY

Multi-use and multi-user adaptability support the use and sharing of non-residential spaces more intensively at night or at weekends in new 'hybrid' mixed-use building or neighbourhood models, enabling co-located activities for efficient use of the building stock over the 24-hour cycle and/or seasonally. It includes the use and sharing of public-private indoor and outdoor spaces and their boundaries by different people and communities at different times and the associated conflicts with this (e.g. workers use spaces during the days while residents use them at other times). It also includes the need for different stakeholders or agencies that enable or support adaptations (e.g. different agencies support older people to achieve ageing in place).

The emergent concept of multi-use(r) housing typology and the hybridisation of domestic and non-residential spaces was implied though its absence. The title of Marco *et al.*'s 'Enforced Togetherness' and Blanc & Scanlon's paper highlight the loss of non-residential spaces that could otherwise be appropriated for 'non-domestic activities' as and when needed. The pandemic forced groups of several unrelated individuals to contain all their daily activities within a small apartment rather than flexibly diffusing them by more loosely inhabiting (third) spaces throughout the city (Blanc & Scanlon). This extreme experience does not undermine the multi-use concept but instead

signals its importance and sensitivities to consider accommodating both domestic and non-domestic uses in the same building, or in the nearby living environment.

Even balconies exhibit this public–private tension, visible and exposed yet ‘a space where private and public spheres coexist’ (Smektała & Baborska-Narożny): privately accessible balconies are exposed—and contribute to—the public sphere (e.g. views, sounds, smells, pollution). This also suggests that the adaptive capacity of external spaces is influenced by a broader set of criteria than those inside the apartment. Where balconies were too exposed, residents used plant pots and screens to adapt privacy levels on balconies to create public–private thresholds.

Both Holliss (2017) and Webb (2020) argue that the work-at-home hybridisation is a re-emergence of an historically integrated form of living and working physically found in front-room workshops with domestic door and window shop frontages.¹ Current residential planning regulations have led to a domestic monoculture with the separation of dwelling and workplace, hiding the range of work activities and creative production happening within the domestic sphere. Working from home can often mean more than the provision of a desk space. A range of other activities comprise work, and adaptations need to provide for this variety. Co-housing or communal housing could provide a multi-use flexible ‘common house’ enabling anything from workshops, laundry, kitchens large enough for shared meals and parties, playrooms, guest bedrooms or meeting rooms. McCall touches on this multidimensional scale, and the multi-agency task of getting design of inclusive adaptable housing right; there are design implications ranging from the neighbourhood to the kitchen sink.

2.5 NEW KNOWLEDGE GAINED

New knowledge emerged about the significance of balconies. Smektała & Baborska-Narożny refer to active and passive balcony uses related to activities taking place on the balcony. Peters & Masoudinejad extend the concept of active and passive balconies in relation to adaptive balconies. Active balconies make adaptability easy to undertake by the residents themselves. In contrast, passive balconies are less easy to adapt by the residents themselves (and hence less frequently altered). Their case studies of passive and active balconies hint at something more than Schmidt & Austin’s (2016) active and passive adaptations and the usual consideration of adaptability of internal spaces. Peters & Masoudinejad begin to carefully articulate the combination of fixed parameters and how these can combine in varied strategies to exploit potential flexibility of a space. They show how internal space can support or hinder the use and adaptability of external space, and vice versa. It opens up the idea of adaptive capacity of balconies in similar ways as internal spaces, *i.e.* adaptability can be enacted (or not) as required. This contains insights that designers can use: functional space (size and ratio, enclosure, orientation, other comfort parameters); convertibility strategy (layers that residents can fold, slide, open and close to change the sense of enclosure); relating to the adaptability strategy within the dwelling itself (expand or shrink—within apartment and rooms, level of indoor–outdoor integration). Active balconies exhibit more of these parameters under residents’ control. Clearly, design guidance has to cover both specification for parameters and also rules or instructions for their operation and management by the residents and later estate managers. This was also highlighted by Smektała & Baborska-Narożny, in addition to improved industry–user communication about the in-use balcony phase to understand user needs.

New methods are described in this special issue, and insights gained. Increased engagement with existing or prospective inhabitants can help to better understand their needs and show how these needs can be fulfilled. For example, a method demonstrating the value and usability to potential occupants that adaptability principles and practices offer (Tarpio & Huuhka). Marco *et al.* show that interpretive phenomenological analysis (IPA) revealed that participants altered use of the home environment during the pandemic and it is a successful way of researching housing adaptability. Smektała & Baborska-Narożny developed a process combining the use of photographs with stakeholder interviews that gives a deeper understanding of the use of balconies. Villa *et al.* used post-occupancy evaluation (POE) in social housing and emphasised its importance to:

feed planning policies and practices that can address residents' needs [in Brazil].

To aid this process, they developed a 'Resilient House Evaluation Matrix' for social housing resilience attributes and indicators, *i.e.* environmental comfort, environmental adequacy, flexibility, accessibility, wellbeing and engagement. The use of in-depth case study plan analysis (Peters & Masoudinejad) revealed the adaptive capacity of balconies and their interconnections with internal spaces that made a significant contribution to overall dwelling adaptability. All these methods also support the communication of findings.

Some prior knowledge was further verified. For example the need for temporary or permanent home adaptations of different kinds at different times of the life course (*e.g.* Hipwood, Marco, Tarpio, McCall); the 'accidental' adaptability of pre-war UK dwellings typically with timber stud internal walls and floors (*e.g.* Hipwood, Marco); the importance of access to outside spaces (*e.g.* Hipwood, Marco, Smektała, Peters & Masoudinejad), as well as the importance of visual, auditory and thermal comfort (*e.g.* Hipwood, Marco, Peters & Masoudinejad) for wellbeing.

The importance of harnessing home adaptations as obvious trigger points for consequential low energy retrofit adaptations was drawn out by Hipwood, but it was also noted that this connection is not always obvious to residents or installers.

Connection to outside (to the extent of appropriating external spaces as part of 'the home') and digital connectivity were also found to be crucial. The latter enabled certain functions to take place from home (*e.g.* working, studying) and enabled non-physical social interactions that require separate physical spaces within the home so as not to disturb others and to separate, *e.g.*, home and work (*e.g.* Marco, Blanc). Hence, a level of spaciousness is required to enable residents to achieve different levels of communality and individuality—these are not 'nice to haves' but essential to have (*e.g.* Marco, Blanc, Villa).

The value of researchers returning several years after occupation to understand how spaces actually accommodate changing household scenarios was evident in Villa *et al.*'s and Hipwood's research. Their findings need to be integrated in design, construction and policy guidance.

3. CURRENT CHALLENGES FOR RESEARCH AND PRACTICE

3.1 GAPS IN UNDERSTANDING

Gaps in understanding that still remain are the most intriguing. Although some user modification was evident, greater modifications were more problematic (Villa *et al.*, McCall). This highlights the importance of purposely designed housing with sufficient adaptive capacity for different future scenarios. Where are the studies describing, assessing, comparing and quantifying the value and co-benefits of different forms of adaptability for residents and housing providers? What are the barriers that have inhibited more mainstream take-up of adaptable systems and approaches and how can they be overcome?

The tacit learning embedded in practical design-led experiments certainly exists, but it requires careful articulation if it is to be captured in guidance and replicated elsewhere. This special issue also highlighted that designers, policymakers and developers have little understanding of how spaces (including balconies) are actually used (*e.g.* McCall, Tarpio, Smektała & Baborska-Narożny, Blanc & Scanlon, Villa *et al.*). Hence, participation and communication with stakeholders and users, as well as robust POE are needed to increase designers' and clients' understanding of user needs, expectations and their actual practices. POE can reveal whether or not the hoped-for benefits of adaptable designs are realised, and if any unintended consequences occurred (*e.g.* financial premiums associated with adaptability, contractual clauses or an unwarranted degree of redundancy), which need to be avoided or mitigated. Research is required into the role of the attitudinal and perceptual aspects of housing adaptability affect in-use adaptability and resident wellbeing.

3.2 CASE STUDY: A DESIGN FOR ADAPTABILITY

A recent example of low-cost housing in London, 'House for Artists', illustrates all four approaches to adaptability (environmental, spatial, social and multi-use) and many of the themes identified in this special issue. It was the unusually innovative and forward-thinking organisational client² who has taken the lead championing this novel housing solution, and it is hoped that POE will be undertaken in future. The scheme consists of a dozen studio apartments, three to a floor, with two floors of three interconnected co-housing units, then two further floors of (currently) discrete flats, above a large ground floor workspace and public space opening directly onto the street.

3.2.1 Spaciousness

How the layout arose from a clever design response to fire regulations is described in detail elsewhere (Holliss 2022). Holliss (2022) concludes a fundamental requirement for adaptive liveability is more space to work from home. The House for Artists achieves this generosity of space by removing internal circulation, giving over an additional 7–8 m² in each flat to usable living space instead of circulation areas, without additional cost. Similarly, higher than normal ceilings improve cross-ventilation in summer and increase daylight penetration: both ideal for healthy working and living environments.

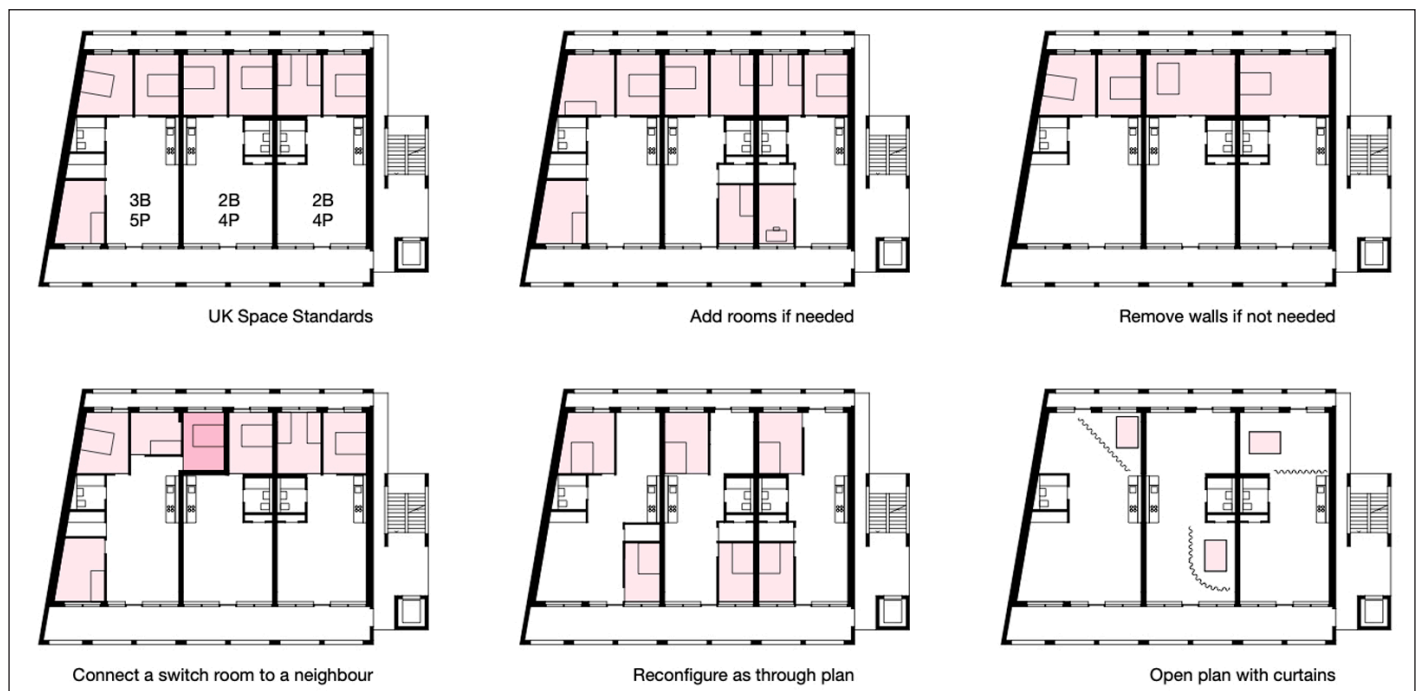
The rooms can accommodate multiple uses; their functional definition is less significant than their experiential qualities: generous proportions washed with light from the north, connection to adjacent spaces, and, through the large windows and circulation decks, to the sky and surroundings.

3.2.2 Mixing work with home

Holliss (2017) notes the varied nature of work, and the myriad occupations and ways of working from domestic spaces. This reinforces that one solution for mixing work at home is not going to work for all (e.g. using a spare bedroom as a study). Hence, the House for Artists displays many elements of 'Open Building' thinking. The perimeter-based structure of the block gives future flexibility to structural alteration at low cost. All internal walls can be removed or more built if additional rooms are needed. The co-housing flats already have interconnecting, soundproofed, double doors, enabling immediate opening up of a large, shared space when desired (see Figures 1 and 2 for the locations of workspace or for co-living). In future these floors could even serve as fully public work or exhibition spaces, should the need arise.

Figure 1: House for Artists by Apparata Architects. The simple structural/servicing matrix allows differing apartment layouts with minimal physical adaptation by the residents.

Source: Apparata Architects.



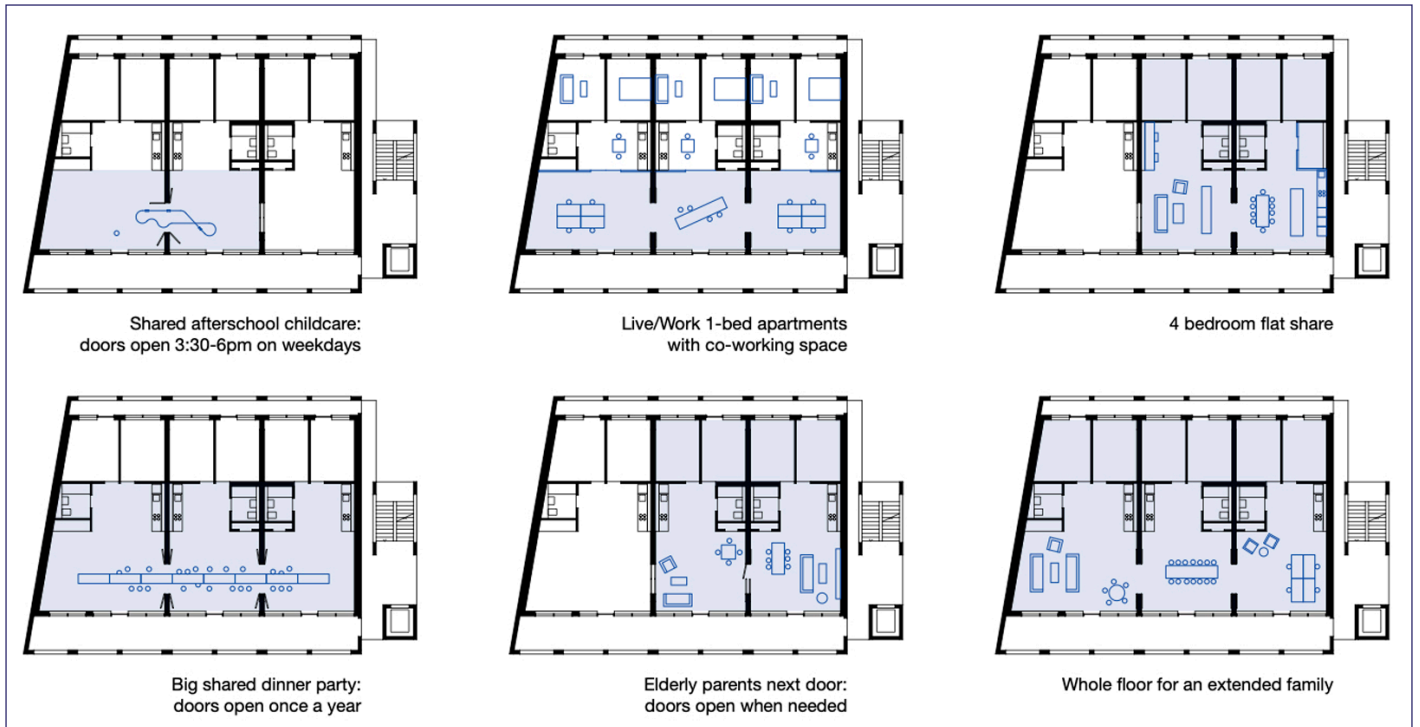


Figure 2: House for Artists by Apparata Architects. Co-housing floors can easily accommodate varied shared activities or scenarios for different households. Source: Apparata Architects.

Guy Debord's vision of apartments being combinable adjacent is achievable. Units can extend via openings in the non-structural party walls between apartments, and the social relationships established between the residents, the practice of cohabitation and expanding and contracting ownership, gives this plausible potential. Moreover, thinking about the most fluid layer (*i.e.* 'the stuff'), alternative future layouts have been carefully considered. For example, beds can be relocated in varied locations; desks and seats are encouraged in the access decks (not seen as fire hazards).

However, there are some compromises made and this model might not replicate so well in other countries or at a larger scale. For example, shared external access ways that pass in front of private living spaces may work well in temperate climates, but in some cultures the openness or lack of feelings of security or privacy may not be acceptable. While shared access ways and balconies adjoining personal living and workspaces can support co-living and social infrastructure, this may be more problematic in standard housing or require social negotiation of territories in larger co-housing communities. Further, depending on the layout chosen by the residents, kitchens may lose access to natural light altogether.

3.2.3 Social interactions

The ground floor windows act as shop fronts onto the creative workshops of the artists living above. It manages to be both a public and domestic building and is a potential example of new hybrid building models, part of multi-use and multi-user adaptability. The nature of this public function, adding to the liveliness of the neighbourhood, is reliant on positive 'artist-led gentrification'. While it is not yet clear how multi-use adaptability is achieved by the private users of the ground floor public functions, the project demonstrates the benefits of flexible living, not as an expensive indulgence but as a low-cost affordable option, an amenity accessible to all. The local authority client had tight cost constraints budgets. This project addresses the challenges that many landlords such as housing associations or commercial housing developers would want answered:

- Where to spend money and how to best invest in flexibility?
- What is offset or compromised on?
- How did it control costs?
- How replicable and desirable are the principles?

If it is possible to achieve this adaptive capacity within local authority budgets, the viability of flexible schemes should be possible to attempt similar elsewhere. It is also important to ensure that adaptive capacity is properly communicated to the residents by professionals, and that housing needs and expectations are well understood by the supply side (e.g. McCall, Tarpio & Huuhka, Smektala & Baborska-Narozny).

4. MAINSTREAMING ADAPTATION

This special issue makes clear both the needs and benefits that accrue from providing adaptability in housing. Moreover, it is financially viable to do so. Many countries are embarking on retrofitting strategies for their housing stock to mitigate greenhouse gas emissions and improve energy efficiency, accepting that dwellings need to be adapted to future climate scenarios. It would be wise and cost-effective to include adaptation in retrofit programmes. But there is an equal justification for making the housing stock more widely adaptable—especially given the decreasing size of dwellings and changing nature of work and education. A home's adaptive capacity supports an individual's and a community's resilience when faced with different life events and their associated disruptions and consequences. Therefore, policymakers, planners, clients, developers and designers are challenged here to make new and existing dwellings more adaptable.

Multi-agency collaboration is needed to ensure that the current fragmented individual solutions do not privilege some groups and exclude others. This is crucial for housing adaptability more broadly if it is to become inclusive and accessible for all.

Housing adaptability is related to issues of social and spatial justice, and it is crucial to ensure that inequalities are not exacerbated, *i.e.* the inability to adapt one's living environment due to lack of access to a living environment with adaptive capacity. Housing adaptability also extends to adaptations to a changing climate, making climate justice highly relevant to housing adaptability (Klinsky & Mavrogianni 2020) to ensure vulnerable and less privileged people have the same affordances and capabilities. Avoiding injustices will require a shift from an individual to a public responsibility to provide (and implement) solutions that are accessible to all and not an add-on, affordable only to the lucky few. This equitable adaptability applies to new dwellings as well as the existing stock, especially to achieve ageing in place and may prove a powerful motivation to mainstream housing adaptability.

NOTES

- 1 Integrated workspaces within housing, animating residential street frontages, are reappearing as an English typology. For example, see Alison Brooks Knights Park Housing in Cambridge, 2021 (https://hdawards.org/scheme/15496_scheme-5/).
- 2 The scheme's client is the London Borough of Barking and Dagenham. The project was delivered by BeFirst, their design and sustainability committed development agency, and designed by Apparata.

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REFERENCES

- Aravena, A., & Lacobelli, A.** (Eds.). (2012). *Elemental: Incremental housing and participatory design manual*. Hatje Cantz.
- Brand, S.** (1994). *How buildings learn. What happens after they're built*. Penguin.
- Chester, M. V., & Allenby, B.** (2019). Toward adaptive infrastructure: Flexibility and agility in a non-stationarity age. *Sustainable and Resilient Infrastructure*, 4(4), 173–191. DOI: <https://doi.org/10.1080/23789689.2017.1416846>
- Debord, G.** (1956/2006). Theory of the *Dérive les Lèvres Nues* 9 [1956]. In *Situationist international anthology* (trans. K. Knabb, Revd Edn, 2006, pp. 62–66). Bureau of Public Secrets.
- Femenias, P., & Geromel, F.** (2019). Adaptable housing? A quantitative study of contemporary apartment layouts that have been rearranged by end-users. *Journal of Housing and the Built Environment*, 35, 481–505. DOI: <https://doi.org/10.1007/s10901-019-09693-9>
- Groak, S.** (1992). *The idea of building: Thought and action in the design and production of buildings*. E & FN Spon.
- Habraken, N. J.** (1972). *Supports: An alternative to mass housing*. Architectural Press.
- Habraken, N. J.** (1998). *The structure of the ordinary: Form and control in the built environment*. MIT Press.
- Holliss, F.** (2017). Designing for home-based work—Lessons from two English villages. *Architecture and Culture*, 5(1), 21–39. DOI: <https://doi.org/10.1080/20507828.2017.1283127>
- Holliss, F.** (2022). A house for artists. *Architecture Today*, 318 (March/April), 40–51. <https://architecturetoday.co.uk/a-house-for-artists-apparata-barking/>
- Huuhka, S., & Vestergaard, I.** (2019). Building conservation and the circular economy. *Journal of Cultural Heritage Management and Sustainable Development*, 10(1), 29–40. DOI: <https://doi.org/10.1108/JCHMSD-06-2019-0081>
- Klinenberg, E.** (1999). Denaturalizing disaster: A social autopsy of the 1995 Chicago heat wave. *Theory and Society*, 28(2), 239–295. www.jstor.org/stable/3108472
- Klinsky, S., & Mavrogianni, A.** (2020). Climate justice and the built environment. *Buildings & Cities*, 1(1), 412–428. DOI: <https://doi.org/10.5334/bc.65>
- Langston, C.** (2014). Measuring good architecture: Long life, loose fit, low energy. *European Journal of Sustainable Development*, 3(4), 123–160. DOI: <https://doi.org/10.14207/ejsd.2014.v3n4p163>
- Lee, E., & Park, N.-K.** (2010). Housing satisfaction and quality of life among temporary residents in the United States. *Housing and Society*, 37(1), 43–67. DOI: <https://doi.org/10.1080/08882746.2010.11430580>
- Lehtinen, T., Maununaho, K., Varis, K., Kaasalainen, T., Luotonen, E., Saarimaa, S., Nisonen, E., Pelsmakers, S., Tarpio, J., Blomgren, W., & Castaño de la Rosa, R.** (2022). *Asuminen muutoksessa: Asunnot ja naapuruston jaetut tilat asukkaiden arjessa* [Housing in change: Apartments and shared spaces of the neighbourhoods in everyday life] (Final Report). ASUTUT Sustainable Housing Design Research Group, School of Architecture, Tampere University. <https://urn.fi/URN:ISBN:978-952-03-2388-2>
- Luoma-Halkola, H., Häikiö, L., Maununaho, K., & Sointu, L.** (2019). Asumisen tarpeet—peruslähtökohta [Housing needs—Basics]. Ketterän asumisen keittokirja. <https://housingcookbook.com/aiheet/asumisen-tarpeet-%E2%80%93-peruslahtokohta>
- NHF.** (2020). *Housing issues during lockdown: Health, space and overcrowding. A briefing on research supporting the Homes at the Heart campaign*. National Housing Federation (NHF). <https://www.housing.org.uk/globalassets/files/homes-at-the-heart/housing-issues-during-lockdown---health-space-and-overcrowding.pdf>
- Park, J.** (2019). *One hundred years of housing space standards: What now?* http://housingpacestandards.co.uk/assets/space-standards_onscreen.pdf
- Pelsmakers, S., Poutanen, J., & Saarimaa, S.** (2020). (Hybrid) architecture in and over time. In M. Pedersen Zari, P. Connolly & M. Southcombe (Eds.), *Ecologies design: Transforming architecture, landscape and urbanism* (pp. 268–275). Routledge. DOI: <https://doi.org/10.4324/9780429279904-35>

- Pelsmakers, S., Saarimaa, S., & Vaattovaara, M.** (2021). Avoiding macro mistakes: Micro-homes in Finland today. *Nordic Journal of Architectural Research*, 3, 92–127. <https://urn.fi/URN:NBN:fi:tuni-202202161974>
- Rabeneck, A.** (2021). Housing adaptability: Some past lessons [Commentary]. *Buildings & Cities*. <https://www.buildingsandcities.org/insights/commentaries/housing-adaptability-lessons.html>
- Rabeneck, A., Sheppard, D., & Town, P.** (1973). Housing flexibility. *Architectural Design*, 43(11), 698–711, 716–727.
- Rabeneck, A., Sheppard, D., & Town, P.** (1974). Housing flexibility/adaptability? *Architectural Design*, 44(2), 76–91.
- Saarimaa, S., & Pelsmakers, S.** (2020). Better living environment today, more adaptable tomorrow? Comparative analysis of Finnish apartment buildings and their adaptable scenarios. *Yhdyskuntasuunnittelu*, 58(2), 33–58. DOI: <https://doi.org/10.33357/ys.89676>
- Schmidt III, R., & Austin, S.** (2016). *Adaptable architecture: Theory and practice*. Routledge. DOI: <https://doi.org/10.4324/9781315722931>
- Schneider, T., & Till, J.** (2005). Flexible housing: The means to the end. *Architectural Research Quarterly*, 9(3–4), 287–296. DOI: <https://doi.org/10.1017/S1359135505000345>
- Tarpio, J.** (2015). Joustavan asunnon tilalliset logiikat. Erilaisiin käyttöihin mukautumiskykyisen asunnon tilallisista lähtökohdista ja suunnitteluperiaatteista (Doctoral dissertation, Tampere University of Technology, Tampere). <https://urn.fi/URN:ISBN:978-952-15-3510-9>
- Tarpio, J.** (2020). Kestäviä kaksioita kestävässä kerrostaloissa? [Sustainable flats in sustainable buildings?]. *Arkkitehti uutiset* 2020(5), 10–13. http://www.e-julkaisu.fi/SAFA/au_arkkitehti uutiset/5-2020/mobile.html#pid=10
- Tunstall, B.** (2015). Relative housing space inequality in England and Wales, and its recent rapid resurgence. *International Journal of Housing Policy*, 15(2), 105–126. DOI: <https://doi.org/10.1080/14616718.2014.984826>
- UN.** (2018). *68% of the world population projected to live in urban areas by 2050, says UN*. Department of Social and Economic Affairs, United Nations (UN). <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>
- Warwick, E., & Lees, L.** (2022). Osmosis across defensible space: observations and lessons from Dérives in London during COVID-19. *Urban Geography*, 43(6), 810–820. DOI: <https://doi.org/10.1080/02723638.2022.2039435>
- Webb, M.** (2020). *New rooms for the new normal*. http://interconnected.org/home/2020/04/02/new_rooms
- Woolf, V.** (1929) *A Room Of One's Own*. Hogarth.

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