

Customisation Prior to Housing Construction in Australia

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Due to ongoing concerns about the economic fallout caused by the COVID-19 pandemic affecting large populations, the demand for affordable housing is increasing. In particular, low-income households continue to struggle with unaffordable rents throughout major Australian cities. Assailed by this growing affordability crisis and deemed environmentally unsustainable, Australian suburbs are in need of revitalisation. The implementation of mass customisation solutions can heighten the sense of identity within a community and also significantly increase occupant satisfaction.

Keywords: affordable housing ; customisation

1. Introduction

The growing global population necessitates housing be delivered both at a rapid pace and in consideration of sustainability ^[1]. Many regions are facing a housing crisis that is exacerbated by the ongoing COVID-19 pandemic due to economic factors and the decreased pace of construction operations ^[2]. In recent years, Australia's housing market has experienced periods of soaring property prices and severe rental shortages. The COVID-19 pandemic, together with interest rates being at historic lows, has further exacerbated the housing affordability crisis. Data from the Australian Bureau of Statistics (2021) show that home ownership rates for people aged under 40 are in decline. Low-income households especially continue to face unaffordable rents in major Australian cities ^[3]. If the current housing crisis is not addressed, then it will lead to significantly hampered labour productivity, increased social inequality and economic and financial instability.

The traditional suburban dream in Australia is becoming increasingly impossible in light of the country's current housing, environmental and social circumstances. Assailed by the growing affordability crisis and deemed environmentally unsustainable, Australian suburbs are in need of revitalisation in order to stay relevant in contemporary Australia ^[4]. Customisation of housing is an option that can heighten the sense of identity within a community and also significantly increase occupant satisfaction. As Jacob states, "Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody." ^[5]. Combatting urban sprawl with higher-density housing should not necessitate the sacrifice of such customisation. The aim of this research is to develop an affordable housing scheme which allows for customisation prior to construction for owner-occupiers. This research explores the types and financial models of mass customisation solutions for housing, which could enable a new practice that allows individual lifestyles and personal preferences to be part of design/construction processes. Design guidelines for future developers, architects and planners have been developed, integrating financial models to realise increased customisation.

2. Affordable Housing in Australia

Australia is beginning to follow in the footsteps of other nations that have used sustainable urbanism to improve the owner-occupier market by creating more affordable houses and lessening the impact that homes have on the environment. Affordable housing is the initiative taken by government bodies to ensure that each group of income earners within the country can afford housing, with a focus on low- or moderate-income households ^{[6][7]}. Projects sustained as a *Baugruppen*, or building group (BG), provide great examples of this and have been used in this article to identify design principles and missed opportunities in the existing one ^[8]. The concept of BG originates from Germany and means that a collective of future residents are involved in the design process of houses, to identify a shared vision for their future home ^[9]. Australia's housing market is dominated by developers' drive for profits, and though its purpose is still to create a product that is user-orientated, it lacks a relationship with those who will call the result their home ^[4]. Increasing worldwide awareness of the importance of sustainability has invoked waves of experimentation and innovation to develop better ways to live, and consequently, also better ways to build. The unfolding housing affordability crisis is forcing people to get

creative to take control of their money, their individuality and their homes. McGreevy ^[10] argues that the diversity and availability of affordable dwellings cannot meet people's expectations because the demand for affordability in established suburbs is high. Based on established research, there is already a clear demand for appropriately located, affordable and sustainable housing across a range of dwelling types ^[11]. Infill development allows for the revitalisation of existing areas, which can satisfy demands for desired locations.

Newton and Glackin ^[11] have developed a method to interpret how this development can occur, and their innovative arenas for residential precinct regeneration in the greyfield areas of Melbourne demonstrate how to meet such demands. Their conclusion determined that eight items aid this process, including new finance models and new design model innovations. As has been noted, Australia's housing market has revolved around developers' need to make profits; thus, removing the developer altogether paves the way for a solution towards affordability and individualisation ^[12]. An upheaval in the current housing market requires changes to existing methods of housing procurement. Sharam and Bryant ^[13] identified that, for medium-density housing especially, most if not all aspects of the process need to be altered, which includes but is not limited to developers, owner-occupiers, investors, financiers, building codes, taxation, consumer laws, strategic and statutory planning, land form, spatial relationships and construction types. Hamiduddin and Gallent ^[12] identified that, while in most countries speculative home building is the norm, there are some countries such as Germany and Switzerland within which group or community building is the rule, not the exception, and involves the concept of like-minded people pooling their finances to buy and build individualised homes within a single structure without the need for developers. Their design process is intensive, and their goal is to establish and enable personalisation within private spaces and gain collective agreement in relation to other realms of the property, i.e., communal spaces. They have observed that while the first motivation is generally affordability, the second is customisation. The benefits of reduced costs, combined with the potential for individualisation to match personal needs and preferences, are core values defined by Brown et. al. that see BG as rooted in garnering both a sense of collective identity and appropriate costs.

3. Mass Customisation prior to Construction

There is a gap in the existing one which fails to fully explore the connection between mass customisation technologies and their application in housing construction. Research focused on that area, combined with the financial and social model that the Baugruppen mode of development has, can tackle some of the current issues of the Australian housing market. As observed by Benos and Durate, the housing market is dominated by the production of a limited variety of houses which are either repeated or re-interpreted in response to market analyses ^[14]. Such production is what results in the uniformity of suburbs and the disintegration of the individuality of homes ^[15]. The idea of customisation is one that requires greater time and effort, and therefore more money. Finding a way to mass produce customisation can streamline processes to make customisation economically viable. The concept of mass production was introduced by Henry Ford in his development of the Ford Model T as a car for everyone. The concept's application to architecture has been experimented with by many towards the goal of achieving affordable housing, including by Walter Gropius and Le Corbusier; however, such products thus far have had limited success.

There are risks in developing housing using the BG model, as there are many unknowns that may increase time and cost. Crabtree and Hes ^[16] state that the current housing sector is entrenched in its reluctance to deviate from existing methods. However, examples of housing constructed by Nightingale Housing, which fit into a very niche, unprotected section of Australia's housing economy, prove change is being sought and people are willing to be involved. Doyon and Moor identified that the BG model used in Nightingale Housing enables customisation through a reductionist approach ^[17]. Jeremy Macleod, the Managing Director of Nightingale Housing, celebrates the model as a system for delivering sustainable, affordable, liveable and socially engaged means of living and creating. Seemann and Jahed ^[8] recognise that the BG model is a venture in collaborative housing that responds to a growing need for affordable urban homes with a pronounced social network within an existing community. This method looks to not only alleviate fiscal pressures and produce a sustainable urbanism, but also seeks to humanise the development industry ^[17]. There are several other areas in which resident participation in the design process is potentially beneficial. For example, residents may be involved in making changes to local systems—including codes, laws, standards, etc.—to enhance their sense of identity as well as contribute to the growth of the suburb ^[18]; such collaboration between designers, builders and craftspeople in the design and construction process can potentially enhance the quality of the design and construction of housing while also reducing building costs ^[18].

A one-size-fits-all approach for manufacturing is not only becoming irrelevant but also unaffordable. While volume home building continues to produce a variety of options for different clients, the need to reduce urban sprawl has produced a better typology for customisable housing. The lack of consideration towards rental markets leaves many gaps to be filled; therefore, the inclusion of Baugruppen into the rental sector could benefit both the occupiers who are limited to renting as

well as potential investors. People who invest would be silent partners in the sense that they put up the money and entrust its design and function to the architecture staff. The reason this is viable is because such rental properties could be built in the same manner as traditional BG methods, and hence money would be saved. This could establish an availability for affordable, social and sustainably conscious building typologies that seek to humanise the development process through discussions and choices. For customisation to be extensively enabled in rental properties, a new system must be specifically devised that allows more alterations to be made, while avoiding risks for owners and renters alike. The allowance of customisation in rental properties is of value because it enables an expression of individuality for those who occupy them. A house is actualised into a home through an expression of the occupants' individual preferences reflecting their identity ^[19]; thus, individualised design is a significant variable for occupant satisfaction ^[20].

The use of software tools and parametric, axiomatic and modular designs all have their place in the development of mass customisation. Griz and Amorim ^[21] describe that shape grammars can be utilised to prescribe alterations prior to occupation; they are a set of rules that constitute a customisation grammar based around a central pitching point to create an apartment building. A method to introduce value via customisation is identified by Hentschke and Formoso ^[22] and is in agreement with Rocha's proposed conceptual framework of strategies for defining scope in house building; the core categories of decision are customisation units, solution spaces and classes of items. The theory of supports created by John Habraken was one of the most influential examples of an articulated quest for user participation and diversity ^[14]; the theory suggested two elements, with supports being the rigid parts of design and infills being the flexible part ^[23]. Habraken later identified a system of synthesis to streamline the process which consisted of a spatial system and function system, a structural and construction system, and a stylistic system. There are various opinions for how to proceed with mass customisation in housing; however, much of the existing ones fails to identify a viable financial model that would make such options achievable ^[13], and its relationship with clients doesn't extend much beyond clients simply picking and choosing from a finite range of options on a computer.

The existing one pertaining to mass customisation has been focused; there is a lacking of material pertaining to individual designs for medium-density housing. The application of a viable financial model in combination with the principles discovered in the mass customisation highlights missed opportunities within our housing market. O'Callaghan and Pickett ^[4] remark that there is a lack of recognition of both density and diversity being non-cohesive in the suburbs, and call for it to be addressed.

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