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## **CUSTOMER-ORIENTED APPROACHES TO HOUSING AFFORDABILITY IN INDUSTRIALISED HOUSE BUILDING**

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### **Abstract**

Prefabrication has long been considered as a means to lower the cost of house building globally, however the reality is often not as simple. Many factors affect its ability to achieve affordable housing solutions, such as uncertainty around what prefabrication actually is, what it should be, and the processes involved. Rather than a 'product first' solution, examining the process of industrialised house building (IHB) can offer a more integrated model.

This paper consists of a comparative case study analysis of two established IHB companies which utilise a customer oriented business model with the aim of increasing affordability in different contexts: Boklok in the multi-residential market in Sweden today; and Pettit and Sevitt in the single residential housing market in Australia 50 years ago. Despite their obvious differences in location, timeframe, social and cultural contexts, they are a useful (and novel) comparison as both originated from a customer, rather than product, driven model that addressed the prerequisites of specific users at a reduced housing cost to varying success.

This paper reflects on the barriers and best practices these companies encountered whilst aiming to achieve housing affordability whilst utilising IHB principles, and may provide a valuable source both internationally and in Australia.

**Keywords:** Housing Affordability; Industrialised House Building; Prefabrication.

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## INTRODUCTION

Housing unaffordability in Australia has been a pressing issue in the media for some time now, with Sydney's median housing price reaching almost 13 times the median salary last year (Cox and Pavletich, 2018). The solution to this problem has been met with numerous proposals at the national and state planning levels through to individual grassroots developments (Rowley & Ong, 2012; Yates & Milligan, 2007), yet the availability of affordable housing continues to decline.

There have been several ways to define housing affordability in recent history, but the Australian Housing and Urban Research Institute (AHURI) provides a definition for Housing Affordability as “*a general term, used in reference to the whole housing system, expressing the relationship between housing costs (prices, mortgage payments or rents) and household incomes.*” This term can refer to both public and private housing, however it is more commonly associated with the private housing market and sale prices.

In addition to quantifiable indicators of housing affordability, like the cost of housing relative to income, a number of other factors affect the affordability of housing. The Grattan Institute's recent report (Daley, Coates & Wiltshire, 2018) on housing affordability also highlights a number of factors affecting the high cost of housing in Australia including: taxation settings which encourage homeownership and investment in housing, while discourage downsizing; economic growth, rising household incomes and access to credit; immigration; and shifts towards city centres; supply falling behind demand; not enough medium density supply; planning regulations limiting development; and social housing not adding to supply. Friedman (1992) also notes housing can be designed for affordability through both cost reduction, which affects the immediate quantitative aspect of affordability, or by value adding, which is a more qualitative and long term. The latter may affect how people live in their homes, adaptability and flexibility of the house, operational costs, sustainability, maintenance and future resale. These aspects, though less quantifiable, are just as important to tenants.

In the academic discourse on housing affordability, the majority of texts focus on two main areas: the history and future ability of policy makers, such as government bodies and planning authorities to moderate the pricing of housing; or on finance, investigating the effect of subsidies, interest rates, taxes and alternate financial models (see Daley, Coates & Wiltshire, 2018; Yates & Milligan, 2007; Rowley & Ong, 2012; etc). Design and construction seem to garner very little attention.

However, prefabricated construction bucks this trend, and has long been suggested as a means of achieving affordability through not only cost reduction, but also time reduction, improved quality and better sustainability. Many academic texts refer to the affordability of prefab including: Friedman and Cammalleri (2015) cover the idea of *Cost Reduction through Prefabrication*; Davies (2005) who talks to the “cheapness” of prefab in *The Prefabricated Home*; and Smith (2010) mentions the term “affordable” almost 60 times in *Prefab Architecture*. Industry reports like McKinsey also claim prefabricated methods could reduce housing costs by up to 16% (Woetzel et al, 2014).

Yet prefabrication alone hasn't solved the housing affordability either in Australia or internationally. This is due to a number of factors, but Steinhardt et al (2014) documented recommendations for the increased uptake of prefabricated housing in Australia, which included a number of principles outside of construction alone including marketing and consumer demand, transport and logistics, utilising labour availability, and more complete business models.

Housing affordability requires a more holistic approach: integrating aspects of supply and demand, finance and development models, government subsidies and policies, planning frameworks, sustainability, design and construction. Industrialised House

Building (IHB), provides a lens through which to view businesses which integrate aspects of planning, process, product, relationships and customer focus.

IHB is often used interchangeably with prefabrication in common discourse, however prefabrication is merely one part of a larger process. Burnham Kelly (1951) began to touch on the idea of IHB when discussing prefabrication as encompassing not just production but also management, design, procurement, and marketing. Kelly saw prefabrication as a holistic and integrated process encompassing all aspects

Today, Lessing's definition of Industrialised House Building is the most comprehensive, stating "*Industrialised house-building is a thoroughly developed building process with a well-suited organization for efficient management, preparation and control of the included activities, flows, resources and results for which highly developed components are used in order to create maximum customer value.*" (Lessing, 2006, 93). This process integrates 8 aspects including the planning and control of processes, technical systems, prefabrication, long term relations, logistics, information and communication technology, reuse of experience and customer and market focus. It is this last point of customer-orientation which this paper uses as a starting point, exploring companies which have utilised a customer-oriented IHB model to achieve affordability.

In addition to the definition and processes above, Lessing and Brege (2015), recognised three phases involved in successful IHB models including: firstly, market research which identifies a customer and their needs; second, the product and platforms are developed to meet these requirements; and finally, the increase of predefined and prefabricated production while balancing investments with product volumes and customer value. The case studies presented in this paper have been broken down into these three phases, showcasing how the two companies have used their customer-oriented IHB processes in an attempt to create better housing affordability.

This paper begins to examine two companies which utilise these IHB practices, with a specific focus on customer-oriented approaches, to produce more affordable housing in alternative contexts. Much of this research so far has been completed on Swedish IHB Companies (Lessing, 2015, Brege et al, 2014, etc) as there is a greater concentration (and acceptance) of IHB companies in the Scandinavian region. For the purposes of this research, a comparative Australian company has been chosen to exhibit the potential of IHB outside of the Swedish perspective. The differing customer base and subsequent product offering of the two companies provides an interesting comparison as to how housing affordability practices are not limited to specific housing typologies or demographics.

## **METHODOLOGY**

Research into IHB companies, and the strategies they employ in achieving housing affordability, is multi-faceted, covering areas like design, marketing, production, construction, and processes. This does not fit neatly into quantitative data collection methodologies, but instead requires a qualitative methodology.

A case study methodology was chosen as the most suitable, with the flexibility to interpret the diverse data collected. As Yin (2003) and Eisenhardt (1985) define case study methodology, this research began with an initial research question from which the case studies were chosen. This research question limited the companies which would fit into the case study, as they had to utilise IHB, have a customer-oriented approach, and include an aspect of housing affordability. Data for these case studies was collated from literature reviews, international fieldwork, observations, and contemporary and archival documentary materials.

## **CASE STUDY: BOKLOK, SWEDEN**

Boklok is a multi-residential housing provider in Sweden, which is a joint venture between Ikea and Skanska, established in 1996 following a national decline in residential construction. The partnership between Ikea and Skanska was built upon the company's existing assets - Ikea brought brand culture and customer knowledge, which was complimented by Skanska's proven track record in home building. However, the company runs itself independently of both companies, often relying on the brand confidence and customer loyalty of Ikea rather than the more negative connotations associated with the predominantly concrete construction of Skanska.

### **Customer + Marketing**

As a company Boklok have a strong strategic plan that is focused around their customer base, which was identified as a gap in the market. Boklok (2012) established that the market was lacking in dwelling for small households of 1-3 people, despite 75% of the households falling into this category. Lars Wild-Nordlund (2007), the managing director of Boklok for 6 years, noted that they began by asking the questions "*Who are we building for? How much will the people we are building for be able to pay?*"

After identifying the target market (*1. Right Customer*) before any other works begin, Boklok noted the customer needs, desires and budget. From this detailed market research, a restrained product range is developed (*2. Right Product*). Once the product is defined, specific types of land are sourced to minimise time and money spent on planning and site works (*3. Right Land*). Next, the site must also be sustainable from a financial and social aspect, ensuring there is enough customer demand as well as infrastructure (*4. Right Project*). Only at this point does Boklok employ prefabrication techniques, making sure their industrialised factory processes are optimised to the design and customer needs (*5. Right Construction*). Finally, the product is marketed directly to the original customer in store (*6. Right Marketing*). This is done in conjunction with Ikea, who already have an established brand identity and the facilities to sell the products (Lessing 2017).

This customer-oriented model gives a strong direction to the business, ensuring it doesn't focus purely on product, but has a more holistic view of the entire process from development through to construction. This process which stems from the customer needs, desires and budget, was a result of classical customer research investigating affordability, household typologies, location, and desires in a home. This also stretched to include post-occupancy evaluations which has in turn affected redesigns of the product.

Boklok also identified that these small households were usually key workers with restricted budgets, and priced their product accordingly working backwards from a typical income. This has since been re-evaluated, and now apartments are sold at 25% less than comparable housing within the same area. The apartments are sold in an Ikea store closest to the development, through a lottery system. Clients must provide their own financing as they would with any other apartment.

Affordability and the 25% target are non-negotiable for Ikea and is part of their ethos for Boklok. To ensure this affordability is retained, if an apartment is sold within 2 years of purchase, the owners can only sell for a 10% margin above the original sale price. Despite producing housing significantly below market rate, Boklok is the most profitable area of Skanska, and the practises employed within Boklok are beginning to be replicated throughout the whole business (Lessing 2017). This highlights the efficiencies of their process including targeting strong market research, industrialised construction and the lack of customisation in the project.

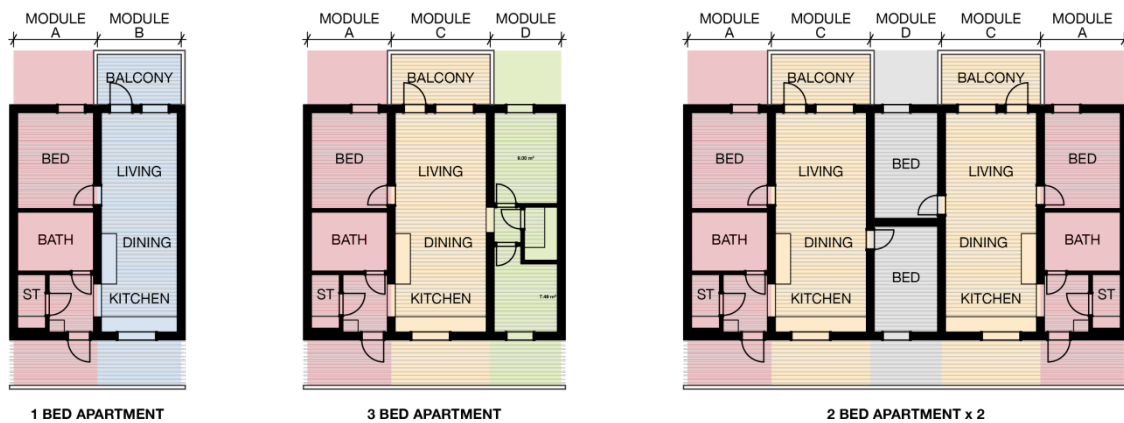
They have the third most satisfied customer of housing developers in Sweden and believe this is because customers know exactly what they are getting when they purchase

a Boklok home, with delivery always meets expectations. However, as market competition grows on the back of Boklok's success, the company would like to become more unique and push innovation in the affordable housing sector (Lessing 2017). The initial market research for Boklok targeted specific locations, which lead to the design of the 4 storey Flex apartment. As the market expands, Boklok are looking to increase the structural capacity and fire resistance of the modules to allow buildings to reach up to 6 storeys, making more urban sites viable.

### Product + Platform Design

Boklok have a very restrained product family, which limits customisation and streamlines manufacturing processes. Changes to the design are only in the cladding and gable or pitched roof options, with the customer simply being able to choose which apartment size they require. Despite this lack of personalisation, the designs offered by Boklok were based on the previous customer research and Ikea's previous experience regarding lifestyle choices of customers. This led to a product which was designed to have ample natural light and ventilation, as well as the use of open plan spaces and natural materials where possible.

Boklok currently offers three product ranges – the Flex Apartment system, the Radhus row house, and the Classic apartment design (which is in the process of being phased out). Most projects utilise the 'Flex' system which was designed to be adaptable to urban sites, reaching a maximum of 4 storeys. 'Flex' is produced using 4 different modules which make up 1, 2 and 3 bedroom units, as well as an additional vertical circulation module (see Figure 3). Each apartment consists of two or three modules and includes a full kitchen and large combined bathroom and laundry as well as ample storage. The main window is full height in the living area to give an open feeling to the space and connects through to the balcony, while the smaller window in the kitchen allows for cross ventilation in the open plan space.



**Figure 1: Boklok Flex apartment plans and module layout.**

Every year Boklok has a review to update process, platform and product before they think about relaunching a new product. The benefits of their pure product family (fully mandated design with little to no customisation), is that more time can be spent on the design and development of the predefined product range, rather than repeated across a large range of designs. The company works with approximately 5 architects for new ideas in this design process, before selecting a single architect for their external facades and site layouts. All the documentation and detailing are completed in house by manufacturing engineers.

## **Procurement, Production and Construction**

As a reflection of Boklok's low income client and subsequently standardised product, the company utilised an efficient and highly repeatable construction methodology. The volumetric prefabricated modules are constructed using building materials typical of buildings in the area, whilst utilising manufacturing processes to minimise time and waste. The modules are assembled using timber framed panels with rockwool insulation and plasterboard lining, similarly to typical housing construction in Sweden and most of the Western world, with all interior and exterior finishes being fitted out in the factory before transportation to site.

The production of these units is expected to top 2,000 modules per year by 2020, with most being completed by manufacturing works rather than those trained in construction. This is representative of the 'product' mentality and process employed at Boklok in their standardised offering.

Finally, sourcing land for the projects is a substantial part of ensuring the affordability of the overall development. Boklok employ at least 6 people who constantly work purely on land acquisition, to make sure there are no zoning issues and no excessive site works required for the land. As such Boklok do not hold any land and have a short turnover once purchased. Instead they ensure that the sites purchased require minimal preparation (mostly flat sites with good soil conditions) and those with simple planning rules.

## **CASE STUDY: PETTIT AND SEVITT, AUSTRALIA**

The residential housing market in Australia underwent an organisational change in the 1950's and 1960's, as traditional builders were replaced by larger project housing companies. This made little change to the materiality of houses, but instead injected industrialised and manufacturing processes into the burgeoning market.

Pettit and Sevitt were one of the most well-known and enduring project house builders of the time. Established in 1961, the company rose from the ashes of SunLine Homes where its founders Brian Pettit and Ron Sevitt had worked in accounting and sales respectively. Pettit and Sevitt's enduring legacy comes not from their construction practises, but from the strong design ethos which pervaded their houses, as well as their marketing and brand.

### **Customer + Marketing**

Unlike Boklok and their key-worker customer base, Pettit and Sevitt's targeted customer was a middle-class, young professional who Boyd notes as "*the sort of person who cannot afford an original painting, but buys a good reproduction, who cannot take a front seat at a concert but queues up for the gallery and keeps a record collection at home, who picks the good books from the lending library, the imaginative movies on the suburban circuit, and the well-designed items of kitchenware.*" (Boyd 1949, 84).

The company aimed to provide architect designed houses to the masses, making them affordable enough for the lower and middle classes, while retaining the aestheticism and functional planning of well-designed homes at the time. This was not only an aspirational aspect of their customer, but the culture of the time which commodified design and the inherent value it brought to architecture.

Originally the company worked on previous experience with customers from SunLine homes, but eventually commissioned market research on their customer base. The majority of these were young professionals, which mainly consisted of pilots, advertising people and architects (O'Callaghan, 2007). The needs of their customer

weren't just in the desire for good design, but in flexibility and personalisation of the houses. This meant the ability to adapt to specific sites, as well as the flexibility to cater to different lifestyles of their younger professional customer base. This was to become the reasoning behind much of the modularisation of floor plans in the Pettit and Sevitt Range.



Figure 2: Pettit and Sevitt advertisement in Australian Women's Weekly, Wednesday 2 July 1969, 45.

This idea of personalisation wasn't only evident in the design of the houses, instead it became the cornerstone of the Pettit and Sevitt Marketing campaign as well. Advertisements were targeted to 'The Different Australian', and individuality was emphasised firstly through the architect involvement in projects. Each house design was complimented with up to five standard variations as well as differing roof lines. Also, customers were also given cardboard cut-outs which represented standard modular elements, allowing them to play around with designs to suit their whim, involving them in the design and customisation process.

The personal touch was carried further into the marketing strategy of the company, with the advent of the famous conversational advertisements. Like Figure 1, many print advertisements would feature discussions between Pettit and Sevitt in dialogue, presenting information without the hard sell. These became so successful, even in the advertising industry, the ads continued to run for years to come (even following the departure of Brian Pettit). The ads complimented the brand's identity as a front runner and innovator, and worked to create interest among customers rather than promote the housing designs. From the beginning, Pettit and Sevitt developed a highly organised marketing and management system which was continually refined. This is likely due to neither Pettit or Sevitt being builders, but having had extensive experience in the financial and marketing sectors of the project housing industry, and represented the 'culture of production' in the company.

### Product + Platform Design

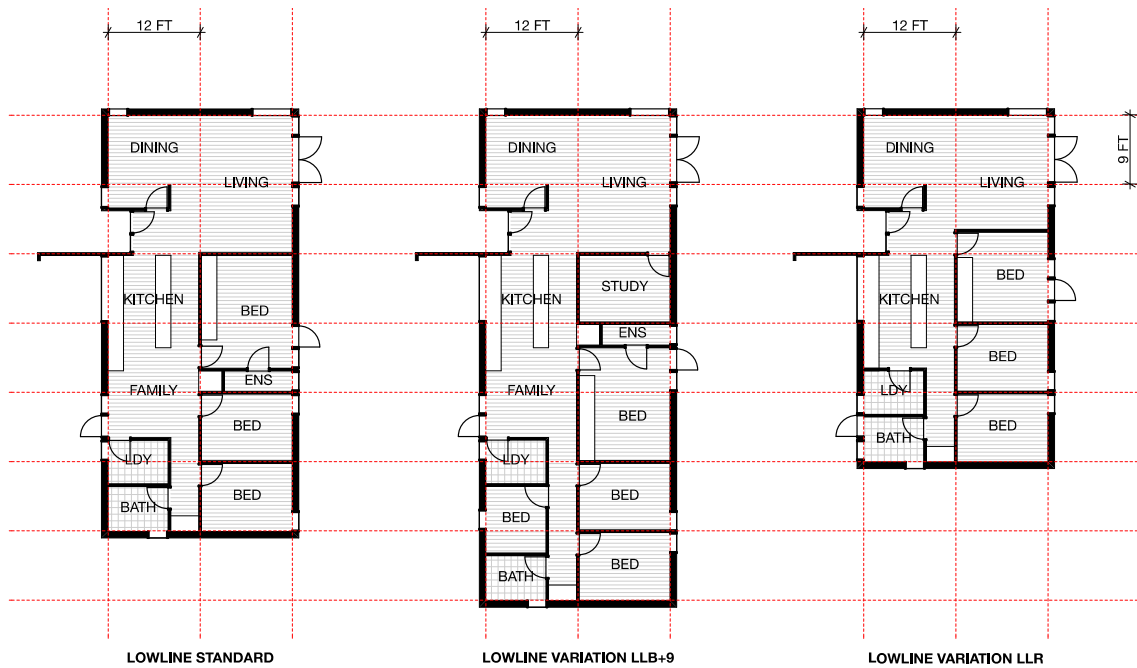
In McKay's review of contemporary Australian housing Pettit and Sevitt summarised how their market research affected their housing designs: *"The end result of our product development and marketing techniques is an economically priced house, designed by outstanding architects, that incorporates a built-in flexibility to cater for the needs dictated by the site, and the client, and a system that will allow the client to express his own personality"* (McKay et al, 1971, 128).

This flexibility to cater for the site was a key factor in Pettit and Sevitt homes. Though many were traditional flat floor plates, the Split Level and other designs like the curvilinear, were specifically designed for uneven terrain typical of the northern suburbs in Sydney. This allowed most homes to cater to a wide variety of sites, without extensive underpinning or changes to the plan which added additional costs to the home.

In addition to this site flexibility, Pettit and Sevitt had a range of seven to eleven basic houses, each with four or five standard variations that increased (or decreased) the size of the house, added additional bedrooms, or did a combination of both, in order to cater for a wide range of consumers. This also tried to ensure the "individuality" of the



houses and that customers felt like their home was designed specifically for their family (O’Callaghan, 2007).



**Figure 3. Lowline B standard plan with expanded and reduced variations.**

Of all the houses the Split Level and the Lowline are the most well-known, each having had many iterations of similar designs, and were the only houses displayed at the first Pettit and Sevitt exhibition centre in Carlingford in 1963 (O’Callaghan, 2007). The Split Level went on to have 4 ‘Marks’, of which the first one remained the largest and the final represented the smallest and cheapest of the designs at approximately 102sqm. However, the Lowline house is considered to be the most famous of the Pettit and Sevitt houses, with many still standing in Sydney, Canberra and the eastern coast of Australia today. In contrast to the Split Level, the Lowline was a flat-roofed, single-storey house, that was rectangular in plan with a linear progression from social, living areas to private bedrooms (see Figure 3).

Most importantly the Lowline encompassed many aspects of affordability, beyond just the price. The Lowline was described in 1964 as having “*outstanding design and detailing [...] it combines economy in construction with full provision for both the practical needs of family living, and the emotional satisfactions people should get from the form and content of a house and its environment.*” (Wilson, 1964).

### **Procurement, Production and Construction**

Pettit & Sevitt incorporated a ‘culture of production’ into almost all aspects of their business, which they likely adopted from their time at SunLine homes which had “pioneered the commissioning, production and marketing of architect-designed project homes in Sydney” (O’Callaghan, 2007). From the marketing strategy through to the administrative operations and the construction, the company represented itself in much the same way as a commercial manufacturer - employing industrialised building methods, though on a much smaller scale than what we may consider as IHB today.

Eichler and Kaplan (1967) noted this involvement of manufacturing and marketing, outlining the role of the merchant builder, in contrast to other types of builders, included

a “rapid turnover of a product which he manufactures and merchandise to the consumers.” Woolley, the architect on many of the designs, notes that “with the advent of merchant building, the house has become a ‘product’ in the same sense as other manufactured items, such as washing machines and motor cars” (Woolley, 1967, 12), and it was in this way Pettit and Sevitt chose to portray themselves.

Quality product was key for Pettit and Sevitt, which was reflected in their construction process including streamlining the “production drawings and increasing the range of details... to achieve a high degree of faithful reproduction of the prototype houses” (McKay et al, 1971, 128). Part of this industrialised building process, was the semi-prefabrication and logistics utilised to build the houses. Timber frames were produced offsite en masse, and many processes were integrated rather than sequenced to shorten timeframes. Pettit and Sevitt felt that by using these mass production techniques, they could pass on benefits to the customer, allowing them to afford an architect designed house (McKay et al, 1971).

## **DISCUSSION ON AFFORDABILITY**

The affordability of these two projects is intrinsically linked to both the targeted customer even though the housing products are vastly different, one being a low cost high density apartment model and the other being a mid-range detached dwelling. Both companies utilised IHB processes and an ‘outside-in’ business model to provide more affordable housing options within their specified market.

The affordability of Boklok is fundamentally tied with their desired customer. Focusing on the budget of a single teacher (or nurse depending on the narrative) with a child gives the product a very restrictive budget. At the time Boklok formed this was about SEK3,000/month (about SEK3,820 today, or \$AU590), which would go directly to housing costs. However, during an observational trip to the Boklok headquarters in Malmo, this narrative no longer seems to be directly applicable. Instead, to retain the affordability of housing and the profitability of the company, all apartments are sold at 25% below market rate for similar dwellings in the area. This is still an ambitious and admirable affordability goal, which many affordable housing companies struggle to meet.

In addition to the costs benefits of the Boklok housing product, it is also known for its quality and sustainability. On average the Flex apartments are 30% more energy efficient than Swedish housing requirements according to Skanska, and are built using sustainable materials wherever possible including their timber framed construction.

Pettit and Sevitt houses are commonly referred to as solution for contemporary affordability issues in the media (Greenwood, 1999; Lacey, 2004; Farrelly, 2005; and Edgar, 2016), however as discussed previously, they have always held a specific place in the market. This is described, though sometimes contested, by Pickett in writing that Pettit and Sevitt’s housing was “*neither small nor particularly cheap... An expression of upmarket taste, this was architecture in its traditional role, increasingly confined to Sydney’s North Shore* (Pickett, 1997, 104).” However, in his 1987 thesis, Temple notes that it was estimated a Pettit and Sevitt house was 30% cheaper to build than a comparable architect-designed house. Very little data exists to back this claim, instead Buhrich contextualises the affordability of Pettit and Sevitt houses in a Sydney Morning Herald article in 1968 stating “*two-thirds of all home buyers in NSW spend less than \$10,000 on their homes and it is for this market that the latest Pettit-Sevitt house [...] has been designed.*” Buhrich goes on to conclude that responding to site conditions would usually add an additional 10% to the housing cost and that “*this house (or any other offered for just under \$10,000) is still out of reach of very many home buyers.*” (Buhrich, 1968). It wasn’t until the beginning of 1970, when Pettit and Sevitt began to extend the lower end

of their offerings with the 3136. The small house was first advertised in the Sydney Morning Herald at \$8,790, within the \$10,000 budget of many home dwellers.

Pettit and Sevitt have stood the test of time in regards to their sustainability goals. Each house was designed with large windows to the north, shallow plans for cross ventilation, and large eaves to protect against the harsh sun. The passive solar aspects are complimented by efficient plans and the intangible aspect of design value which still has value today (see Greenwood, 1999; Lacey, 2004; Farrelly, 2005; and Edgar, 2016).

## CONCLUSION

Boklok and Pettit and Sevitt are two case studies which are vastly different: in contexts, typologies and markets. However, both a customer-oriented approach to tailor their product to an identified gap in market needs, while efficiency utilising industrialised building methods to achieve a level of affordability for their specified customer. It is this customer and the business strategy which pervades their entire business: from the personalised approaches of Pettit and Sevitt in their marketing, construction methods, and design which reflect that of their aspiring, middle class customer; to the pragmatic and efficient highly prefabricated and standardised product for a lower income customer.

However, it can be argued this IHB and affordability methodology goes beyond the income class of the customer in both of these companies, and reflects the national culture in their respective countries. Swedish culture is known for their concept of *lagom* or ‘just enough’ and Isenhour (2010) notes this concept moderates consumption within the Swedish culture, but also embodies the “personal connections Swedes feel with nature.” This can be seen in Boklok’s use of ‘natural’ timber construction as well as the restraint in the design and fittings which are ‘just enough’ for a key worker to live a comfortable lifestyle. In comparison Australia, much like America, has a culture of aspiration, at the pinnacle of which is home ownership not only for the middle class but also the working class (Dyrenfurth, 2005). Pettit and Sevitt engaged with these aspirations allowing the middle class to achieve a house worthy of their new found financial security.

It is likely this strong customer, and nationalistic, focus which pervaded the industrialised house building processes of marketing, design, and production of both businesses contributed to their success. It could also be noted the integration and cohesion of all these areas is what allowed the companies to provide a quality, responsive product at a competitive price, and today both companies have an enduring brand legacy which is built from this strong market research.

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