NZIER
NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH

Bespoke residential housing demand and construction innovation

NZIER report to BRANZ and the Building and Construction Productivity Partnership

Final report 17 October 2014

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Each year NZIER devotes resources to undertake and make freely available economic research and thinking aimed at promoting a better understanding of New Zealand's important economic challenges.

NZIER was established in 1958.

Authorship

This paper was prepared at NZIER by Nick Allison and Chris Parker.

It was quality approved by Shamubeel Eaqub

The assistance of Killian Destremau is gratefully acknowledged.

We wish to sincerely thank all buyers, builders, architects, developers, trade merchants, and all other industry stakeholders that kindly shared their time and their insights. The bulk of this research was stakeholder engagement, this paper could not be written without their help. Stakeholders raised a wide range of important and interesting views and issues, and we apologise in advance for not being able to convey all of these views.

L13 Grant Thornton House, 215 Lambton Quay | PO Box 3479, Wellington 6140
Tel +64 4 472 1880 | econ@nzier.org.nz

Executive report

This report examines the drivers of demand for bespoke housing, the impact of building firm size and the barriers to innovation, and thus productivity, in New Zealand residential construction. NZIER interviewed home buyers that commissioned new builds, builders, and other industry stakeholders. The engagement was informed by research and economic benchmarking of housing in Australia and the USA. NZIER did not engage regulators or review regulations; this was outside of the report scope.

The report was prepared for BRANZ and the Building and Construction Productivity Partnership who are concerned with:

- the slow speed of supply due to the types of houses demanded (i.e. bespoke/ tailored homes)
- low productivity in housing construction, which creates the risk that the demand for new houses cannot be met in a timely manner.

The research had two sets of questions, one relating to bespoke and standardised housing and the other to small and medium sized enterprises.

The demand for bespoke and standardised housing

NZIER was asked to address the following questions on bespoke housing:

1. What drives current builder/home owner relationships, and why are builders reluctant to change?
2. Why do homebuyers want large bespoke houses?
3. Why aren't standardised house designs using standard components desirable/being specified?
4. How can buyers of new home builds be assisted to make better purchase choices?
5. What are the best ways to increase building productivity and affordability?

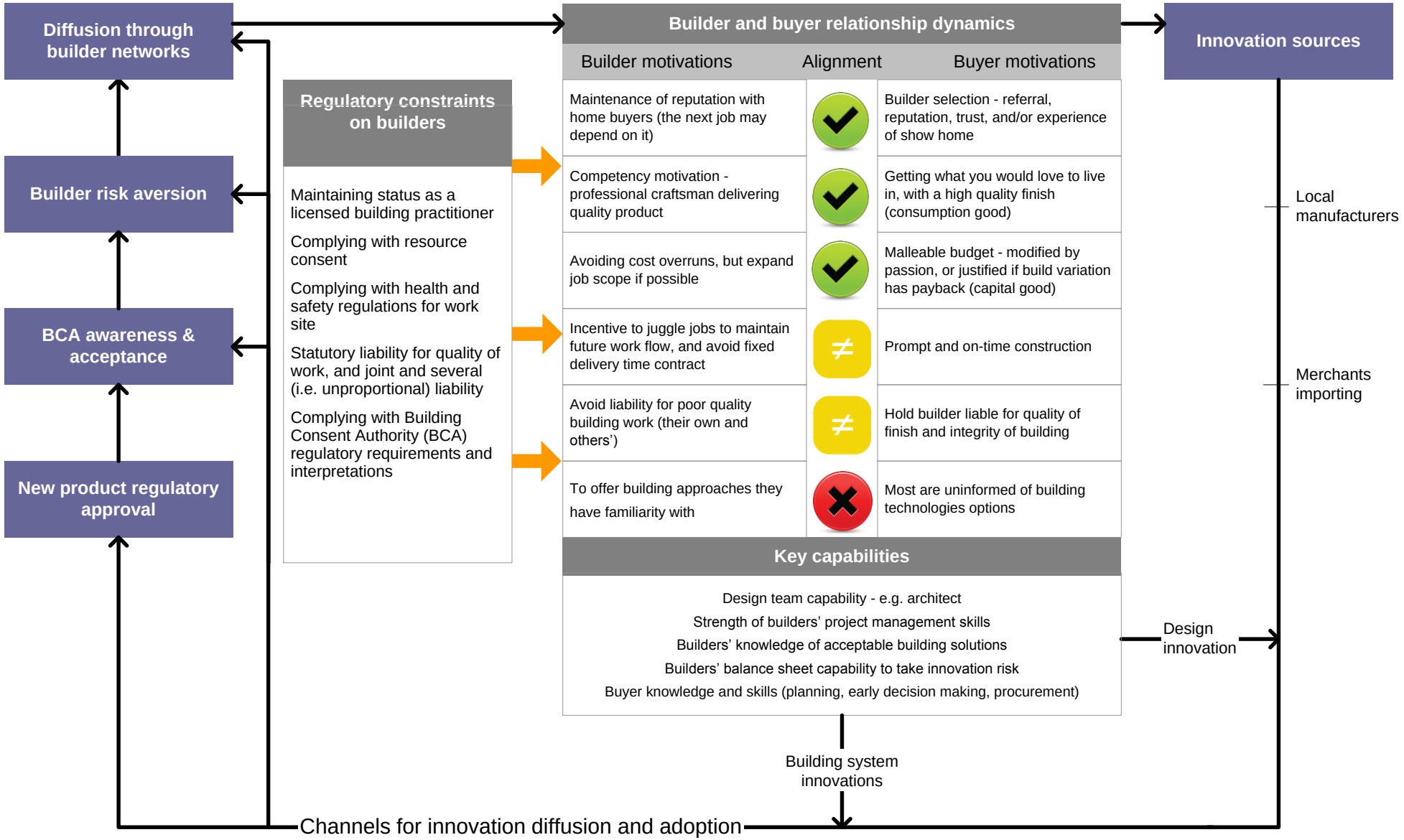
Drivers of house-buyer and builder relationships and innovation

To understand the drivers of innovation and productivity in the residential building industry it is important to appreciate the dynamic between builders and home owners, and the wider innovation context of this relationship. Figure 1 outlines this dynamic in which new home building takes place.

The motivations of builders and buyers are sometimes not well aligned to driving innovation. For instance, builders are likely to offer building approaches they are familiar with and have confidence will comply with regulation. On the other hand buyers are often not familiar with building technologies. Hence buyers may make uninformed consumer choices.

The sources of innovation depend on the capabilities of the design-build team and supply chain innovations from importers, local manufactures and building supply merchants. Innovation also depends on risk appetite of builders and building consent authorities (BCAs) who may face all of the risk for failure of buildings because of joint and several liability.

Figure 1 Drivers of current builder/home owner relationships and effects on innovation



Source: NZIER

Why are builders "reluctant to change"?

It seems not so much the case that builders are reluctant to change their practices around innovation and client engagement, but more that they find it difficult to do so. There are many reasons, including:

- small scale and thus living 'hand to mouth' making it difficult to invest time and money in developing, learning, and/or adopting new approaches
- aversion to innovation driven by their own liability and by BCA aversion following such things as leaky buildings
- networked-technologies, such as emails, need a critical mass of use by builders and suppliers before their use becomes prevalent.

Why do homebuyers want large bespoke houses?

There is no data on the extent of bespoke housing, either in New Zealand or in Australia and USA. Nearly all houses have some degree of tailoring; the question is one of extent. A useful indicator for the extent of bespoke housing is the size of new homes. Bigger homes tend to have more added features (e.g. more bathrooms).

The demand for bespoke housing is associated with the following drivers:

- **increased affluence**: Houses in New Zealand, Australia, and USA are getting larger and have higher levels of finishes and tailored design. This is likely to continue as incomes increase. The average build size in New Zealand is smaller than in Australia and the United States that also have higher incomes.
- **demographic change:** Building larger homes with non-standard layouts is sometimes required by buyers to reflect changing multi-family circumstances. In the United States this is now an important component of demand for bespoke housing.
- **site constraints:** Buyers and builders reported many site issues driving bespoke demand e.g. slope, section shape, high wind risks, view shafts, and access for infrastructural services.
- **regulatory requirements:** Buyers and builders reported view shafts, site coverage, and other local government regulatory requirements, and developer covenants, often limit the applicability of standard plan designs.

The priority for buyers is getting the best quality, including design features, within their budget. Build time is important for buyers but of a lesser priority. The demand for quality features, such as designer kitchens, will continue drive demand for tailoring, even if the above drivers change.

Why aren't standardised house designs using standard components desirable/being specified?

Nearly all of the buyers interviewed were very open to considering greater use of standardised and prefabricated components. They do not specify it because they tend to specify the outcomes they want, and leave it to builders and designers to meet their needs most cost effectively, trusting they have their best interests at

heart. This is appropriate, given that the people best placed to know the alternative means to an end are builders and designers.

In addition, builders interviewed generally had open minds about more standardisation and prefabrication. This was subject to practicalities. If standardisation and more prefabrication proved to be more efficient then builders indicated they would find a way to make it happen (especially group builders).

How can buyers of new home builds be assisted to make better purchase choices?

From our buyer interviews we found:

- **no evidence of substantive market failures**:
  - most buyers tailored their layouts and finishes, they are aware of the costs of doing so, and did not see large cost implications from doing so. The houses still retained many standardised materials and features. Buyers' welfare is thus unambiguously increased from these 'highly tailored, standardised houses'
  - those that procure high-end exclusive houses do so deliberately, and are fully aware of the much higher cost implications. They tend to be very well-informed and advised buyers
- **self-selection of buyers**: The buyers we interviewed struck us as being very competent people, typically undertaking considerable research prior to engaging a builder
- **accidental buyers need more help**: Buyers need more support and advice when rebuilds are forced upon them, such as after the Canterbury earthquakes
- **buyers stress the importance of preparation:** Buyers do not point at the extent of tailoring as a key issue. Rather the main issue is the ability to carefully prepare for the exercise at the outset, including design input, procurement of the right site, builders, designers etc., and careful contracting
- **relationships, trust, and reputation:** These are the most important discriminating attributes in supplier selection for buyers; subject to achieving a reasonable price.

Despite the evident abilities of the buyers interviewed, there is good reason for helpful advice to continue to be provided to them. Building a new home is perhaps the most complex and challenging project buyers may ever take on. What's more it is an 'experience good' – you don't really know what you have bought until you have lived in it. Buyers stressed the need for preparation in part because some incurred costly variations that might have been avoided with better planning.

The key ways for buyers to help ensure a value-for-money outcome is to properly plan the exercise, which includes focusing on:

- **design decisions**: concentrating on the bespoke design decisions up front to reduce the need for variations later on that escalate costs
- **consenting and procurement processes**: doing their homework on the design and building process, being careful with supplier selection, and

ensuring the site is buildable (ideally seeking advice from the builder themselves prior to purchasing a section)

- **seek advice**: accessing advice, and learning from others' experiences, by checking education websites such as www.consumerbuild.org.nz and seeking advice from friends and family
- **formalising contracts**: tying things down in the contract with confirmed prices, rather than provisional estimates, especially when the local area is experiencing price inflation or build time delays (such as in Canterbury).

If buyers improve their contract acumen, for example demanding more timely builds, this may encourage builders to improve project management and in turn help support building sector productivity. Like builders themselves (see below) buyers suggested that builder project management needs to improve.

There appears to be a willingness to pay by buyers for services by BCAs to clarify all the site-specific risks and issues to manage early in the process. This willingness to pay is of a similar order to geotechnical assessments (e.g. some $500–$800).

What are the best ways to increase building productivity and affordability for buyers?

Formal measures show weak construction sector productivity in New Zealand. However, we should be careful in interpreting this because these measures do not necessarily capture improvements to the quality of homes, such as through new and improved features and amenities. When the cost per square metre reduces, the effect on total expenditure may be offset by people increasing the size of the build.

Regarding ways to improve productivity, buyers are generally very comfortable with the idea of more prefabrication of components (provided they are confident in their decisions during the design stage). They seem to be ok with more standardisation that doesn't materially curtail their ability to tailor.

High land prices in New Zealand constrain buyer budgets. A large share of the cost of a new home budget is used to pay for land. If the Government's initiative to increase the supply of cheaper land for affordable housing is successful, it will create opportunities for cheaper and more standardised homes. It will also enable some home buyers to increase welfare through investing more of their budget in larger, higher quality and more bespoke houses.

A range of other ways to increase productivity and affordability are considered in the next section on small and medium sized enterprises.

Small and medium sized enterprises

NZIER was asked to report on the following questions on building industry innovation and productivity:

1. Why doesn't the NZ house building industry innovate?
2. Why isn't the New Zealand house building industry more productive?
3. What are the barriers to more rapid adoption and diffusion of industry innovation, and how can those barriers be overcome?
4. What innovations should the sector be focusing on; and would productivity gains that result in higher profits be passed onto purchasers of new homes?

When interviewing builders, innovation was defined as:

> *(1) New/improved goods or services to your customers;*
>
> *(2) new/improved processes for how you do your work;*
>
> *(3) improvements to how you market to customers; and*
>
> *(4) improvements to your organisational methods (for instance, how you contract, how you procure materials, how you project manage etc.)*

Why doesn't the NZ house building industry innovate?

There are aspects where innovation is minimal, if not entirely avoided, especially the way houses are built for standard homes. However, the house building industry does indeed innovate. In some areas innovation is high, particularly for bespoke houses, which often have novel design elements, including:

- sustainable and energy efficient design
- the multitude of construction systems that have come onto the market,
- adapting house designs and structural construction methods for different demands (e.g. larger homes with more open plan living areas)
- investment (actual and planned) to increase offsite construction, driven in part by the Christchurch rebuild
- organisational innovations, because of the increased role in the last 10 years for group builders (because through repetition they provide greater certainty on buildability, consentability, and price).

Why isn't the New Zealand house building industry more productive?

As noted there are significant problems with accurately measuring building productivity. An alternative is to assess the cost effectiveness of building. NZIER benchmarked the costs of building in New Zealand with Australia and the USA. Contrary to recent understanding, we found costs to construct residential homes in New Zealand are similar to Australia. The cost of constructing apartments is cheaper in the order of 15% in Auckland than in Sydney.

Our result differs from the Productivity Commission's inquiry into affordable housing finding that residential building costs are in the order of 15-25% higher in New Zealand than in Australia. While we do not find such a large difference, there is scope to reduce residential construction costs to a smaller, but still significant, extent.

One might expect to find that the cost of building a house in New Zealand is lower than in Australia, as the cost of labour is around 30% lower in New Zealand. It may be that lower productivity and or higher material costs could explain why we do not find lower building costs for residential homes.

We consider below obstacles to the pace of innovation that, if addressed, could lead to improved productivity.

What are the barriers to more rapid adoption and diffusion of industry innovation?

A common perception is that small business size in the building sector slows innovation. Builders do not view their size as a barrier to adopting productivity enhancing innovations. This is partly because many innovative products and systems used by builders are developed externally; introduced by merchants and large companies in supply chains.

From our interviews, we find that:

- **product innovation is moderate**: there are many examples of new products, processes and services being provided to customers, and the emergence of franchise group builders is an example of innovations in organisational methods
- **innovations appear to centre on design novelties and adopting new products**: although some major innovations are starting to emerge to lower construction costs (helped by the market shock of the Christchurch rebuild), the majority of innovations seem to centre on improving the quality and functionality of homes with new products, processes and services, rather than reducing costs for existing products, processes and services

Innovation that improves the utility of homes is consistent with buyers gaining higher specification finishes and larger tailored layouts, even though this does not appear in measured productivity.

We found that building industry structure has the following attributes that will influence the rate of innovation adoption and productivity:

- **the *shadow size* of firms is much larger** than that suggested by official statistical definitions as builders often contract 'staff' for long periods, rather than employ staff. This helps manage cyclicality of building markets
- **high levels of subcontracting:** With at times 20–25 different trades per house, productivity is highly dependent on good coordination and strong project management
- **the industry is highly networked**: There are networks throughout supply chains with for example merchants training builders (on new systems exposing them to new innovations from a wide range of sources) as merchants compete for market share

While in principle industry structure and networks should facilitate innovation they can also hinder diffusion of some technology. In particular, it may explain the slow adoption of ICT (information and communications technologies) that are networked across suppliers and are subject to critical threshold effects. For instance emailing has helped subcontractors hugely, but there was little individual incentive to move to

email until everyone else did too. This may also be true of adoption of project management systems that rely on ICT.

What innovations should the sector be focusing on, and would productivity gains that result in higher profits be passed onto purchasers of new homes?

Builders say regulatory barriers and risk aversion from local councils and other regulatory authorities are slowing innovation and they recognise that productivity could be lifted with improved project management. From our interviews, we find that:

- **project management is complex and underdone**: Coordinating house builds is very complex, but generally builders do not put enough effort into it maybe because the value proposition is not apparent. There are isolated examples of very good practice
- **regulation is a key barrier to innovation**: for the most part regulation (in a very general sense) is seen as frustrating and constraining the industry's ability to adopt new innovations or imposing excessive costs. Builders, developers, architects and merchants (naturally enough) raised a wide variety of concerns relating to regulations:
  - regulatory requirements impose costs that are larger than their benefits. Some builders lament the lack of cost-benefit analysis to help safeguard against bad regulations and guidelines
  - builders are frustrated that they have very little leeway to think for themselves and must conform to detailed plans to the nth degree, let alone be innovative. The introduction of licensed building practitioners increased costs but allegedly did not increase flexibility
  - barriers to importing new materials and difficulties in proving to building consent authorities (BCAs) that novel materials meet the Building Code (despite having passed through more stringent regulatory assessment overseas)
  - what could be a lack of simple utilitarian approaches that are Acceptable Solutions for building, which would improve affordability. For instance, allowing standard plasterboard to be laid vertically on walls and nailed in, rather than specialist and more costly products that require more staff handling and logistics complications
  - the role of joint and several (i.e. 'un-proportional') liability as underpinning risk aversion and the barriers to innovation, particularly from BCAs
  - how regulations are implemented is sometimes more critical than the rules themselves; for instance, Resource Management Act (RMA) pre-application meetings, which are meant to expedite resource applications, can lead to planners micromanaging developers, for example specifying letterbox styles and the colours of the front doors.

Industry views were mixed as to the extent that productivity benefits would be passed onto customers through cost reductions. Naturally the degree of pass-through is a function of the industry's business cycle. In the longer run many agreed

that the market is competitive, and pass-through would eventually occur when builders run low on work and need to sharpen bids. Indeed, labour and material costs fluctuate in accord with cyclical booms and busts in the industry. We conclude that cost reductions are likely to lead to price reductions in the medium to long term.

Project management

Project management is important for productivity; particularly in times of increasing demand for new builds. Poor project management poses system-wide issues. In peak periods delays can compound project coordination challenges across building sites and cause congestion delays in supply chains (see Dalton et al 2013). Build times extend substantially.

There are several explanations for root causes for project management underperformance:

- **buyers seem not to be expressing their demand** for good project management.
- **capability gaps** arising from underinvestment in skills and vocational training by firms, a labour market failure problem
- **some ICT solutions pay off only if there are enough people using them ('network externalities')**, which may hinder the diffusion of new easy to use project management applications.

We suspect that buyers desire (i.e. are willing and able to pay for) prompt, on-time construction to quality and budget, but that they are not expressing that demand sufficiently. The root cause of this would be the infrequent purchasing of what is an 'experience good', where buyers learn through experience how to procure such a complex product. Buyers can't capitalise on this learning through repetition.

There are benefits to be captured by builders who can be more productive through better project management. Indeed, the larger companies do engage project managers. We found smaller spec builders also doing so, who have strong financial incentives to reduce the cost of borrowed funds by reducing the time to market.

If network externalities are hindering uptake, it could be some time before a threshold is reached where a sufficient number contractors are using apps or other systems for adoption of easy to use project management to become the norm.

There is no silver bullet for improving the systemic issue of poor project management. Whatever the root cause, it is important to monitor the build times (an indirect indicator of project management) and collecting statistics of build times, as is the case in Australia, would be helpful. There could be merit in further investigating the value of showcasing project management demonstration projects using modern technologies that are easily scalable across the industry.

Regulation

It is understandable that local authorities are risk averse as they try and avoid a repeat of liability for leaky buildings. We note that the Law Commission has recommended retaining joint and several liability[1], which tends to pass liability back

[1] The rule provides that two or more persons who have caused a particular loss will each be liable for the full extent of the loss.

to councils. This is in contrast to Australia, where people are liable only for the proportion of the damage they caused. We note that the Law Commission's finding is not Government policy, and that the Government is able to reject the recommendations, if it so chooses. "The Government will carefully consider the Commission's recommendations and formally respond in early 2015"[2]:

We note the Law Commission qualified its recommendation:

> *"Without evidence of the deep pocket issues being a systemic problem beyond local authority participants, we could not recommended the introduction of proportionate liability in this sector [residential construction]"*

We found that systemic risk aversion is curtailing innovation and potential productivity gains throughout the residential building sector as local authorities try to avoid liability as the last party standing (the "deep pockets" issues).

Some stakeholders were frustrated over barriers to importing new innovative materials and products. We understand that there may be a gap between perceptions and reality about how easy it is to import new products under existing regulatory regimes. But new product developer perceptions of importation hurdles, builder and designer norms and BCA practices govern what is done. There appears to be a potentially important role for government to ensure mechanisms to bring new products to markets are simple, cost effective, well understood by the building industry and consistently applied by BCAs.

Building practitioners in the first instance bear the cost of regulations, policies and guidelines, and many complained that cost benefit analysis does not feature in regulatory design. We note in other sectors such as the Electricity Code, that there are Code Amendment Principles that mandate cost-benefit analysis in any regulatory change, and similar provisions for the building sector would be useful.

Areas where there is opportunity for improvement

The following areas for improvement relate to builders, buyers, and the dynamics between them as they lead to innovation and productivity:

1. There is scope for consumer information services and websites to be better publicised, which include guidance to buyers on planning, procurement and contracting (including how risks around innovation will be managed and remedied). For instance, prospective builders and designers could better encourage buyers to study industry-recognised advisory websites. Efforts to do this should be ramped up in the event of rebuilds when houses are destroyed, including from insurance companies and any relevant support services citizens are receiving. Examples of enhancements might include:

    - showcase high performers on consumer sites like *www.consumerbuild.org.nz*, and enrich messages with stories from buyers

[2] Justice Minister Judith Collins, 24 June 2014, *Report on joint and several liability welcomed*. *www.beehive.govt.nz/release/report-joint-and-several-liability-welcomed*. Also see www.lawcom.govt.nz/project/review-joint-and-several-liability, as at 14/10/14.

- support buyers to escalate their demands for good project management, by, for example, key performance indicators and contracted incentives
- more promotion of consumer information that is available, say by encouraging builders to make prospective buyers aware of what is available.

2. Buyers should be encouraged to demand quicker build times, monitor late delivery, and publicly rate builders on on-time delivery and quality. This will indirectly pressure builders to improve their project management, which can have wide positive spillovers to the industry. This can be aided by:

    - a government entity collecting statistics on build times and making these available, as is done by the Australian Bureau of Statistics.[3,] This will help inform understanding of, and research on, improving industry productivity and more generally alert consumers to extending build times and provide useful build time benchmarks
    - further investigation of the value of developing training and project management demonstration projects using modern technologies that are easily scalable across the industry.

There were issues and opportunities that presented themselves that were wider than builders, buyers and the interaction between them. They are important for the residential innovation system as a whole and worthy of further consideration:

- improving communication of Acceptable Solutions (under the NZ Building Code) throughout industry value chains, including architects, builders, subcontractors, and building consent authorities
- facilitating a more rapid importation and adoption of building products, prefabricated components, materials and building systems that are already approved for use in comparable countries
- ensuring that cost-benefit analysis is applied to regulatory change proposals, and that periodic *ex post* evaluation is undertaken to learn what is, and is not, working
- mitigation of BCA and builder risk aversion to innovation arising from joint and several liability.

The drivers of demand for bespoke housing and the barriers to innovation in residential construction are complex. Residential builders and home buyers operate at the nexus of sophisticated supply chains, large project management challenges, and complex regulatory processes. Accordingly there are no silver bullets for improving outcomes. Rather we have identified a suite of opportunities from which initiatives could be developed and undertaken.

[3] Australian Bureau of Statistics, *Building Activity Survey, Average completion time for newly completed dwellings: new houses*, Australian Bureau of Statistics, Canberra

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Tables

1. The research brief

"Words that have now become common place are, 'I know it is not the best solution or the most productive or economical for the client, but do it this way because we can't accept any liability'"

[Quote from an SME Builder]

This section outlines the research brief given to NZIER.

1.1. The problem statement

BRANZ and the Building and Construction Productivity Partnership (our clients) identified that New Zealand is experiencing the start of a construction boom in housing, fuelled by the expanding population in Auckland and the Canterbury rebuild. The industry may not be able to meet this demand for new housing. The concerns related to both the supply side — the ability of building industry to deliver — and the demand side — the bespoke homes consumers are demanding to be built — and the impacts on building costs and affordability.

This research brief followed from previous work carried out by the Productivity Partnership including information gaps identified in producing its Research Action Plan.

Bespoke and standardised housing

Our clients raised the following concerns on the potential for bespoke housing demand to increase costs:

- research by the Productivity Partnership Construction Systems Workstream (Berry, Smart and Reding 2013) and the Evidence Workstream (Seadon 2013) have both identified education of housing sector clients as a priority. Anecdotally clients seem fixated on having an individual bespoke house, and eschew standard designs
- it is not going to be possible to meet the demand for new housing if clients keep demanding high end bespoke housing and the construction industry keeps on building the way it traditionally has, with houses effectively being assembled on site from scratch
- in a survey of new house owner satisfaction Curtis (2014) found that 50% of respondents stated they had selected a design from their builder's standard plans and altered it and 40% selected a one-off design by an architect/architectural designer with major/total owner input. It seems unlikely that clients are really aware of the true costs of this bespoke approach to building a house
- bespoke housing works against the use of standardised designs and components. If a large number of affordable houses are to be supplied by the construction sector in the short to medium term, client preferences need to be understood, and construction companies persuaded to more

efficiently produce standardised and affordable houses. This is only likely if clients demand them.

Small and medium sized enterprises

Our clients raised the following concerns about the building sector having the capability to meet the increase in building demand:

- small and medium sized enterprises (SMEs[4]) employ 80% of those involved in the sector, in firms comprising 5 employees or less. Our clients estimate that SMEs mainly do alterations, additions, and repairs and maintenance work on housing averaging around 70 % of their workload. The balance of 30% is work on new housing
- the SME builders felt that job cost savings of up to 30% could be made through improvements in client briefing, design detailing and business and project management. But SMEs operate in isolation there is little inclination (or time) to undertake comprehensive measurement or upskilling
- Berry, Smart & Reding (2013) used Value Stream and Process Mapping to understand areas of 'waste' across the new house construction sector, particularly concentrating on small builders. They identified four areas of potential productivity improvement. These were:
  - client skill level (knowledge and communication)
  - consenting and tendering processes
  - project management and project planning
  - weather delays
- Berry et al estimated that if the four key areas of waste were addressed the average time to build a house (idea to handover) could be reduced from 48 weeks to 28 weeks
- Tookey (2013) noted that the builders knew it was not in their interests to drop prices or oversupply houses to the market; any improvement in productivity was likely to be absorbed as extra profit by the builders rather than reduced prices to clients
- Tookey suggested that productivity could be improved by:
  - prefabrication to reduce skilled labour requirement and total labour input
  - house size reduction
  - design incorporating common infrastructure elements in multiple houses (such as terraced or semi-detached)
  - deskilling of the building process
  - active management of logistics such as transport.

[4] For the purpose of this report, SMEs are defined as firms that employ 19 or less employees. This definition is the same as that used by of Ministry of Economic Development (2011, p10). MED used this definition, which seems more relevant to a small country like NZ than overseas definitions, which may define them as some 50 or fewer employees.

1.2. Our brief – the research questions

Our clients had the following questions for each of the supply-side and demand-side:

SMEs – supply side questions

- What are the barriers getting in the way of more rapid diffusion and adoption of industry innovation?
  - *What are the barriers to SME innovation?*
  - *How can those barriers be overcome?*
- Why isn't the New Zealand house building industry more productive?
  - *What innovations should SMEs use to become more productive?*
  - *Are savings from productivity improvement likely to flow through to purchasers of new homes?*

Buyers – demand side questions

- What drives the current builder/home owner relationships?
  - *Why are builders reluctant to change?*
  - *Why do homebuyers want large bespoke houses?*
  - *Why aren't standardised house designs using standard components desirable/being specified?*
- What are the best ways to increase house building productivity and affordability?
- How can buyers of new home builds be assisted to make better purchase choices?

The questions are potentially very wide ranging, we worked to narrow them to avoid duplication of other work streams, in particular, the Ministry of Business, Innovation and Employment's work stream on supply chains.

2. Desktop research and engagement design

It is important to view the residential building industry as a highly networked collection of firms subject to boom and bust cycles, rather than isolated single firms with little ability to innovate as often depicted. Innovation flows through value chains in the sector where as many ideas come from outside as inside a firm.

NZIER benchmarked the costs of building in New Zealand against Australia and the USA. Contrary to recent understanding, we found costs to construct houses in New Zealand are not more than in Australia.

We found underlying trends in all three countries for larger, more bespoke and highly finished housing as incomes increase. Lower incomes in New Zealand may constrain this appetite for larger more bespoke houses.

2.1. Our approach

We employed a two-fold methodology:

- **desktop research** to evidence the apparent problems documented by researchers with reference to other markets (Australia and United States) where possible. This enabled us to understand if there is something inherently special about the New Zealand residential construction market and to develop more informed hypotheses of the root causes of industry performance problems
- **direct engagement** with 18 buyers and 14 SME builders through interviews. We used the hypothesis and an understanding of the innovation processes to develop questions for buyers and SMEs. We also interviewed developers, architects/designers, group builders, and building industry merchants to help round out the views expressed and to provide distinctions between SMEs and larger builders.

Following the client brief and insights from desktop research we outline below, we developed problem definition hypotheses that helped us structure questions for interviews with buyers and builders.

2.2. Innovation theory and measurement

Our analysis was also guided by an understanding of innovation theory and practice. Innovation is difficult to measure, and particularly so in the construction sector. Ozorhan et al (2010), in a comprehensive review of innovation in the United Kingdom construction industry, concluded that:

> *"The construction industry has long been criticised for its conservatism and lack of innovation. But is this characterisation*

fair? Much of the innovation in the sector occurs at the project level and tends to be process and organisation based. According to official statistics construction companies invest comparatively little in formal R&D, but rather adopt new technology and develop new ideas to improve their operations. Such innovations are difficult to capture with standard indicators which tend to be more suitable for technology intensive sectors."[5]

Ozorhan (2010) proposes a framework that views innovation from an innovation value chain (IVC) perspective. The IVC view considers three stages of innovation: idea generation, conversion, and diffusion.

Table 1 Innovation value chain

Idea generation		Conversion		Diffusion
In-house	**External**	**Selection**	**Development**	**Spread**
Creation within the firm	Engagement with parties outside firm	Screening and initial funding	Movement from idea to result	Diffusion across firm or industry

Source: Ozorhan, NZIER

Many ideas/innovations flow from outside the firm. For builders, ideas may come from trade merchant suppliers, directly from manufacturers of new products or by observing other builders on a site. As many of the new ideas flow from external sources, we choose to focus on adoption or diffusion of innovations and the associated barriers.

We follow the standard taxonomy of product, process, marketing and organisational innovations in developing our interview methodology.

2.3. Desktop research on buyer issues

Appendix A details desktop research on buyers, which is summarised below.

We have found that over last couple of decades that the cost of a house has significantly increased, accompanied by a substantial increase in the cost of land and the building of larger homes. Whereas, the actual cost of building has increased little. In principle this has important consequences for the mixture of housing buyers demand:

- as the high cost of land constrains buyer budgets , home owners will compromise on the amount they are willing to spend on the house
- as more land is sourced from the sub-division of property it is more likely to be a bespoke house that is constructed to fit within a site
- buyers will avoid putting cheaper more standard homes on expensive land to avoid the risk of undercapitalisation
- buyers who might otherwise demand cheaper standard homes, may not be able to afford to construct these due to the cost of land.

[5] Ozorhon, Beliz, Carl Abbott, Ghassan Aouad, and James Powell. 2010. *Innovation in Construction: A Project Life Cycle Approach*. SCRI Research Report.

Based on analysis of the Australian and United States markets, the indications are that if the cost of land is reduced or incomes grow, people will demand larger more bespoke housing.

There are other drivers of bespoke housing as well; in particular the need to modify homes to fit within sites, the desire for maintenance savings and the need to build larger homes to reflect changing multi-family circumstances.

2.4. Desktop research on building

We found the boom and bust cycle of the residential building industry is critical to understanding its structure and performance. The industry structure is not a collection of isolated firms, but rather composed of highly networked individuals and groups:

- builder and supplier networks are susceptible to 'congestion externalities' in boom times when efficient coordination between many contractors required for construction becomes strained
- builders are able to rapidly adopt some forms of innovation (e.g. new tools), but maybe slower to adopt other forms due to needing a critical threshold of other suppliers to use them too (e.g. use of ICT)
- the building sector is subject to extensive regulation (e.g. environmental, building, occupational and safety regulation), which has the potential to discourage risk taking and innovation
- the effective or shadow size of firms maybe significantly larger as official statistics capture own operators or number employees, but groups of people often work together for long periods as contractors
- building firm size appears somewhat smaller than Australia and substantially smaller than the United States.

On the question of why the housing industry is not more productive, we outline why it is difficult to reliably measure innovation and construction sector productivity. Quality improvements are not well captured in productivity and do not easily reflect innovation on the building site.

In contrast to the Commission's findings, we did not find any robust evidence to suggest the cost of building a detached house is more or less in New Zealand than in Australia (ignoring site preparation). The build cost of multi-unit residential dwellings is actually significantly cheaper in New Zealand indicating the capture of lower labour costs and recent innovations in building systems reported to us in interviews.

2.5. Hypotheses of causes of apparent performance issues

The problem definition hypotheses we developed to explain the root causes for the apparent problems are provide in Table 2.

Table 2 Hypotheses of root causes

Note these hypotheses are not facts, but possibilities that we used to help guide the development of questions and the basis of discussions

Hypotheses of root causes for apparent low performance
Consumer behaviour
House building is **an *experience good* whereby consumers have limited experience** to know what would actually benefit them most before the fact.[6] As a result buyers are risk adverse with a bias to 'proven' traditional construction methods and supported by word-of-mouth references to trusted builders.
Consumers perceptions of "off-the-shelf" houses and "prefabricated" housing are **anchored in past perceptions** of these construction types (school prefabs and state houses) not being able to offer the bespoke features they seek.
As incomes increase new home builders are willing to pay for larger houses with an increase in bespoke features, reducing the demand for standard off-the-shelf houses (i.e. "bespokeness" is a normal good).
Buyers that commission new builds respond to high **land prices as proportion of total house cost being high**: • some consumers priced out of the bottom end of market, reducing the number of cheaper off-the-shelf housing starts • at mid and upper market ends buyers select traditional bespoke builds that achieve 'normal house capitalisation' relative to land price (under-capitalisation risks a price discount in future sale).
Supply imperfections
It is more difficult for suppliers to **establish scale mass production facilities** for prefabricated components than it is in larger markets (high set-up costs, boom and bust cycles, and perhaps threshold effects).
Supply chain imperfections **increase materials costs** for multiple reasons, including market concentration, tariffs, proprietary geographies, patents, trade-secrets.
Builders are reluctant to promote or try new materials, due to a mixture of factors – regulatory uncertainty, small firm size and associated risk aversion (builders survive by selling time and are reluctant to take on risk).
Through small scale and industry fragmentation, **SMEs find it difficult to adopt efficient production processes and practices** (learning curve effects from lack of scale/ experience goods).
Regulatory imperfections
Excessive licensing compliance and qualification costs for tradespeople has reduced their number (such as up-front training for builders, trades, draftsmen, architects etc.), put undue pressure on building costs, and immigration policy is too restrictive and it prevents skilled workers from filling supply gaps.
Regulations and standards (NZ Building Code etc.) are not optimised to minimise costs whilst maximising value.
Local government **consent requirements** on homes add undue cost and complexity, including consent delays and user charges, reducing building innovations.

Source: NZIER

[6] On occasion it may be a *credence good* (an expert problem), whereby consumers can't even judge the quality of what is supplied after the fact. In this case buyers struggle to understand costs and benefits of each tailored modification in advance of the experience.

2.6. Caveats

On combining disparate data

To analyse and shed light on the issues, we have used data sets from Statistics New Zealand, overseas research papers, quantity surveyors and international databases. We have at times combined or compared these data sets to developed new metrics of analysis to provide the insights in the report.

An important caveat with disparate data sources is that they are not always directly comparable. Rather than judging this as a weakness, we view it as strength as it provides new insights and raises new issues and further research questions. We have stated our assumptions and uncertainties concerning the use of various data sets throughout the report.

There are important caveats in interpreting what we report from interviews with buyers of new homes and the building industry. We are reporting what they say, in their voice. We are not trying to report the actual facts of the matter. We report what people say about their need for bespoke housing or what builders say about the barriers to innovation and its adoption.

This caveat on what is reported is important to note when it comes to regulation. Many people in the industry raised this as the major barrier to innovation. While some of the views may at times appear to be inaccurate to a reader familiar with the law and regulatory regimes, these perceptions are often realities on the ground and as such work against innovation and productivity and we thus report them. To the extent, there are misperceptions they need to be addressed through informed communication to facilitate innovation and improve productivity.

3. Engagement key themes

We interviewed buyers and builders (plus designers, developers, trade merchants, and industry body representatives). Engagement with buyers does not point to the extent of tailoring being a key issue; rather the main issue is the ability for buyers to carefully prepare the exercise at the outset, including design, procurement of land, builders, designers etc, and contracting. Builders do not view their size as causing low innovation and productivity, and there are valid reasons that explain firms' structure. Rather builders express regulatory barriers as the key issue slowing innovation and productivity. Underlying drivers to industry structure and performance is excessive risk aversion by councils and buyers not expressing their demand for good project management (which, if improved, could incentivise larger firm scale).

3.1. Buyers

The key themes that emerged from our engagement with 18 buyers are:

- contrary to pre-existing government agency publications, 'bespoke houses' do not necessarily cost more, they are not necessarily voluntary, and people do not haphazardly have them done:
  - that they don't necessarily cost more: highly tailored standardised homes are prevalent. This oxymoron occurs because houses typically have tailored layouts and finishes, but are nondescript and do not cost more relative to an untailored house
  - that they are not necessarily voluntary: often costly bespoke design is driven by land section constraints (topography, sunlight and view shafts, and local regulations on site coverage, or developer covenants e.g. not allowing rectangular standard shape) that limit the applicability of standard plan designs
  - those that procure high-end exclusive houses do so deliberately, and are fully aware of the higher cost implications. They tend to be very well-informed buyers
- relationships, trust, and reputation are the most important discriminating attributes in supplier selection; subject to achieving a reasonable price
- buyers are unaware of how they could influence more standardised construction techniques that lower costs without unduly constraining their own ability to tailor layouts etc.
- the key ways for a buyer to help ensure a value-for-money outcome are:
  - focus on the design decisions up front to reduce the need for variations later on that escalate costs
  - buyers should do their homework on the design and building process, on the 'buildability' of their site, and be careful with supplier selection

  - tie things down in the contract with confirmed prices, rather than provisional estimates
- buyers are generally very comfortable with the idea of more prefabrication of components (provided they are confident in their decisions during the design stage), and with standardisation that doesn't materially curtail their ability to tailor
- buyers would generally benefit from more access to advice and learning from others' experiences. Perhaps building sector stakeholders could do more to encourage buyers to check education websites such as www.consumerbuild.org.nz. Buyers need more support and advice when rebuilds are forced upon them, such as the Canterbury earthquake
- in the majority of instances buyers are happy, if not very happy with the whole process. Dissatisfaction seems to centre around the Canterbury rebuild, with service level drops and massive time blowouts being experienced
- it appears that buyers may be a 'self-selected' cohort. They are generally people that are more capable and willing to take on the challenges and risks of building a new home. The dissatisfaction in Canterbury may in part reflect that many people who would not have entertained the idea of building their own home have been thrown into the task.

3.2. Builders

Key themes that emerged from our engagements include:

Views on innovation are mixed

The majority are of the view that there has been little to no innovation in recent years (ignoring regulation changes), whereas a significant number of interviewees thought innovation was okay, if not fairly high.

We found that:

- in terms of the effect of innovations on consumer welfare it is useful to decompose it into things that lower cost for building a given house, and things that increase the utility of a house build to consumers. Much innovation is centred on the latter, and not the former
- innovation is relatively high for architecturally designed homes, particularly in regard to energy efficiency, sustainability, and modular design; in Canterbury there is a lot more acceptance for innovations
- for the majority of the market, where innovation occurs it focuses on:
  - the shift in the last 10-years towards group builders (to provide greater certainty on buildability, consentability, and price)
  - adaption to the plethora of new materials with special installation requirements (providing additional utility at additional cost)
  - quick adoption of new tools (although the number of new tools introduced to market in recent years is not high)

  - technology:
    - for builders: average uptake of computers, telecommunications (email, cellphones, smartphones, tablets), cloud computing. This is likely because of the practical nature of building, and the network externalities for communications (e.g. you emailing your collaborators is only useful if they use email too!)
    - for designers: computer aided design (CAD), and 3D virtual modelling of designs
  - changing consumer demands for larger living spaces, and modern imported fixtures, fittings and finishes that they learn of from their own research (increasing utility, rather than lowering cost)
  - there are multiple avenues for builders to learn of innovations
- innovation is close to nil for the way houses are built for standard homes; there is relatively high aversion to innovation, driven by builders' own liability and by BCA aversion following leaky buildings.

Small and medium sized enterprises are not the isolated, non-innovative entities commonly thought

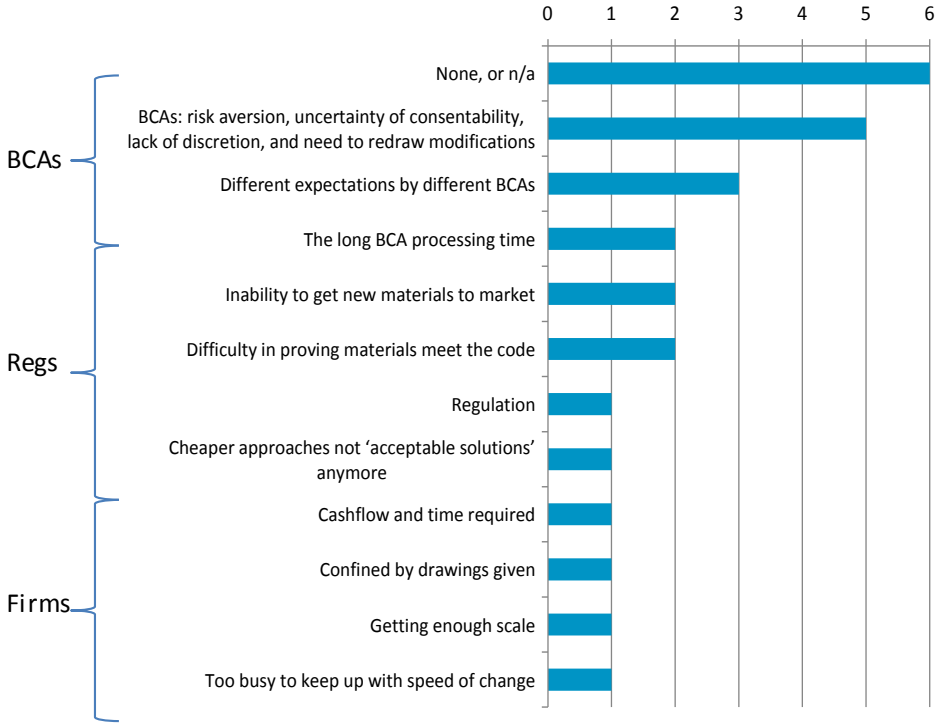
The shadow size of firms can be considerably bigger than official estimates which challenges conventional understanding of industry structure. Some firms have many permanent contractors that are, for all intents and purposes, part of the firm, but officially are not employees. Subcontractors are over and above this, with 20–25 being common over the course of a building project.

The prevalence of collaborating with contractors and subcontractors, and the slow herd uptake of ICT suggests the industry is highly networked. Innovations, like a great new tool or technique, can spread like wildfire. The high degree of competition drives this appetite for mimicking productivity gains.

The regulatory environment and building consent authorities are the top barriers to innovation and productivity

Figure 2 Summary of barriers to innovation

Simplified categorisation of the range of issues discussed in detail with respondents



Source: NZIER

The main barriers to innovation described by builders (as indicated in the figure above) are:

- BCAs: excessive risk aversion, consent uncertainty and lack of discretion, the need to redraw changes, different approaches across BCAs, and long times to process consent applications and inspections
- solutions that meet the building code: barriers getting new materials to market, difficulty in proving to BCAs that novel materials meet the code, older building approaches that are quaint but safe and healthy are apparently no longer acceptable Alternative Solutions.

Some barriers relating to firms were also mentioned, ranging from the time to learn and adapt to new and improved products, processes and services, and not being large enough to really profit from economies of scale.

The recommendations to improve productivity are related not to firms but to regulation. Many builders questioned whether certain regulation changes that imposed cost were worth it. They suggested ways to reduce time, reduce red tape, delegate more authority, and ensure Acceptable Solutions support affordable housing. For instance:

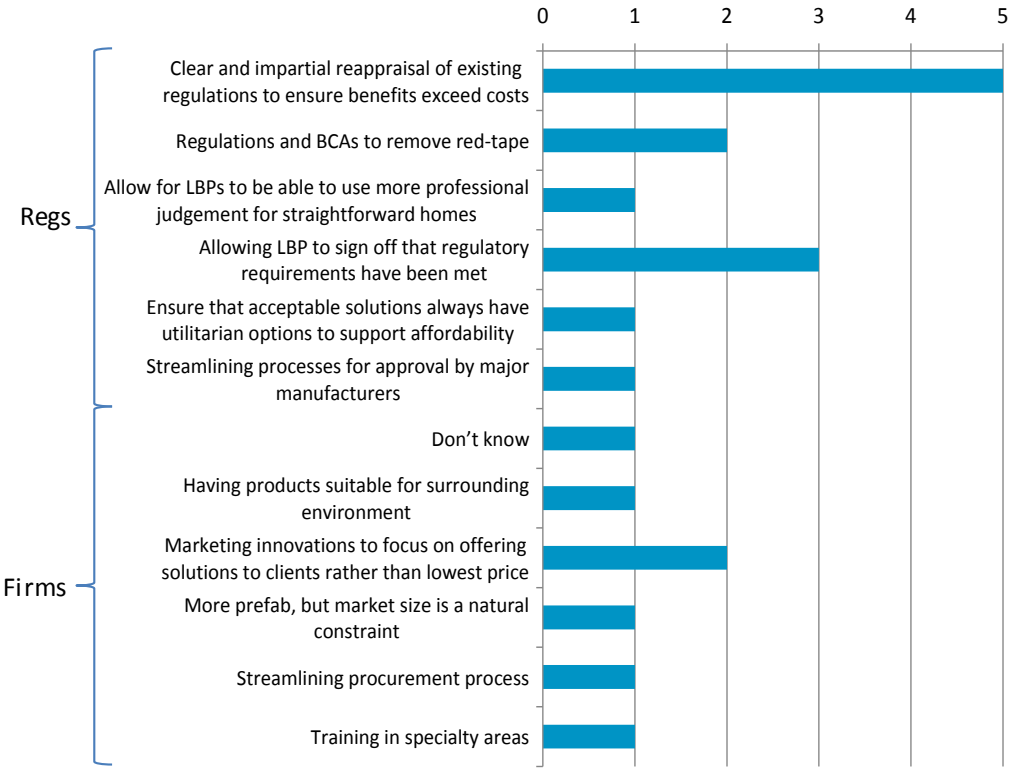
- builders want cost-benefit analysis to be applied to all existing and new regulations and required practices
- licensed building practitioners have faced higher costs but not commensurately higher authority to sign off on work; they want to be given more leeway to exercise professional judgement
- a view was expressed that Acceptable Solutions should include utilitarian approaches to help ensure affordability. There has been creeping up of minimum standards and practices that provide greater utility at a greater cost, whereas less aesthetically pleasing approaches have dropped off the list of Acceptable Solutions without evidence they did not perform.

Innovations and initiatives the sector should focus on to be more productive

By far and away most recommendations related not to firms but to regulation (Figure 3). Many builders questioned whether certain regulation changes that imposed cost were worth it. Some of the suggestions on ways to reduce time, reduce red tape, delegate more authority, and ensure Acceptable Solutions include options that support affordable housing are outlined below.

Figure 3 Respondents suggested areas of focus for innovations to increase productivity

Simplified categorisation of the range of issues discussed in detail with respondents



Source: NZIER

Not apparent that benefits exceed costs of regulation

Engagements with builders and buyers has revealed recent regulation changes that have imposed costs, and it is not clear at all whether there are benefits that more than offset these. For instance, one builder estimates the enforcement of scaffolding regulations cost the industry and consumers around $300 million per annum to solve what MBIE estimates is a $24 million per annum problem. Since then a very recent BRANZ report undertook a cost-benefit analysis of that already introduced regulation and found that benefits were about equal to costs (Norman et al 2014).

A house buyer in Christchurch estimates that the ramped up regulatory requirements on house foundations cost him an extra $100,000 dollars.

We understand that proper cost-benefit analyses were not undertaken prior to these regulatory changes.

Many builders were of the view that cost-benefit analysis should apply to existing and new regulations, guidelines, or anything else perceived by the market as being a regulation.

The acid should be poured on builders to demand better project management

Project management is a low hanging fruit, and should be an area of focus. Some buyers raised poor project management as a major concern, and builders themselves say it is generally not an area where they focus improvements on because the value proposition was not apparent.

There are pockets of high performance in project management, of which there are specific drivers that can be pointed at:

- where builders finance builds themselves, paying ~12% p.a. finance
- where builders are operating at "no-man's land scale", where the owner/builder himself cannot personally supervise construction, and becomes a full-time manager
- where building systems are prefabricated offsite and installation must be right the first time with little room for tolerance errors
- where materials are delivered to remote locations (e.g. barging and helicopters).

Most builders viewed project management as a relatively low value-adding exercise that adds another layer of cost and complexity to jobs. This was the case for larger firms as well as very small firms.

If buyers could ramp up the expectations and pressures on suppliers to ensure quick building turnaround that is on time, then the industry may significantly increase its overall capability in project management.

This could be aided by monitoring average build times and publishing this publicly, as is done in Australia.

There would be spillover benefits, given the high interrelatedness of the market. Dalton et al (2013) estimates that in periods of high activity, slippages have a substantial multiplier effect throughout industry, slowing it down like motorways slowdown in peak periods.

Liability is of major concern to many builders in the industry

Of the builders that were aware of joint and several liability, they viewed it as having a chilling effect on investor confidence and morale in the industry. They saw it as being a key causal factor in the excessive risk-aversion by BCAs.

Some builders saw joint and several liability as a key reason why BCAs are so risk averse, and thus act as such a barrier to innovation and productivity.

The majority of builders had little or no understanding of joint and several liability — the legal rule that could have them being liable for all the damages caused by other parties if they contributed to the same loss, regardless of their proportional contribution. When informed of this, they thought it was outrageously unfair and inappropriate.

Some builders believe it would reduce the supply of builders in the industry (relative to proportional liability like in Australia). Others thought otherwise, given builders try not to dwell on it. Any shift to proportional liability would have minimal impact on

industry structure for many years, until builders had seen first-hand how it was dealt with in practice through the Courts.

Builders are generally open-minded to more off-site construction

Builders overall were either strong supporters of more prefabricated components in house building, optimistic about it, or reserved. No builders we engaged were strongly against it. Some were major investors in prefabrication plants already. Where there were reservations they related to the lack of flexibility in design (initial design, and in-progress variations), the lack of scale in New Zealand to warrant it, and site restrictions that make it not viable. Some reservation was had about buyer perceptions, but it seemed conjecture on their behalf.

Savings are likely to be passed onto consumers at the margin

Views were mixed as to the extent that productivity benefits would be passed onto customers. However, this is only natural, as the degree of pass-through is a function of the industry's exaggerated business cycle.

In the longer run, many agreed that the market is competitive, and pass-through would eventually occur.

4. Conclusion

The Executive Report at the beginning of this report summarises the research findings against the questions, and concludes with some areas of opportunities for improvement. It is not repeated here for the sake of brevity.

Glossary of terms

We wish to thank Pamela Bell, CEO of Prefab NZ for providing a basis for this glossary.

bespoke housing Synonyms: *unique design;*[7] *customised design;*[8] *one-off designs.*[9] There is not a clear demarcation point between what is a bespoke house and what is a "standard" house developed with minimal adaptations from a plan selected from plan or pattern book. The way the term bespoke housing is used in this report refers to either the development of a house plan from scratch or having significant customisation of a plan from a pattern book potentially but not necessarily leading to higher total costs of design or building.[10]

building information modelling (BIM) BIM is the wider set of integrated software tools of which digital drawing is just one tool. Elements embedded in a three-dimensional digital model are assigned values, which can be independently accessed and cross-referenced to produce useful data during the construction coordination process.

closed panel A closed panel is a panelised element that consists of framing with cladding or lining, or both. It may also include integrated services such as plumbing ducts and electrical conduits. See also open panel.

component-based or componentised prefabrication Components are relatively small scale items that are invariably assembled offsite, such as light fittings, windows, and door furniture. It includes structural members (trussed and frames), fittings, fixtures, and joinery that is cut, sized or shaped away from the site for assembly on site. A complete set of components is commonly referred to as a kit, kit-of-parts, or kitset. New Zealand component-based prefabrication includes pre-nailed products; timber structure; steel-framing, timber sub-floor and joinery components; and interlocking solid timber.

construction services These are specialist services typically required for a builder to construct a residential home. These include but are not limited to, land development and subdivision, site preparation services, concreting services, bricklaying services, roofing services, structural steel erection services, plumbing services, electrical services, air conditioning and heating services, fire and security alarm installation services, building installation services, plastering and ceiling services, carpentry services, tiling and carpeting services.

design-and-build The New Zealand residential construction industry has a number of large networks of building companies that provide both design and build services. They are colloquially referred to as design-and-build contractors. Refer to Group Housing.

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7 www.bmtqs.com.au/construction-cost-table

8 Productivity Commission's Housing Affordability paper, s10.4 p184

9 Page and Fung (2012)

10 "Bespoke vs standardised" housing is perhaps best thought of as lying upon a continuum or spectrum, rather than one or the other. Page and Fung (2012) found that nearly all standard plans can have some degree of adaptation with minimal cost (some 90% allow for changes from clients; p11), and that something truly standardised arguably does not actually exist (p16).

flat-pack This is a collection of panels transported in one package to site. Refer to panelised prefabrication.

group housing The 1950s Group Housing Scheme guaranteed the government would purchase any house a builder failed to sell within two months of its completion. This term is now commonly used to describe large networks of design-and-build companies as group builders. Refer to design-and-build.

buyers The term buyers in this report refers to people who commission a builder or another party to build themselves a new residential home.

mass-customisation This is the use of digital technology and CAD-CAM interfaces to produce individual custom designs from standard manufacturing technologies.

modular home This is a house designed using pre-existing modular products or systems and built at the site using a combination of modular and standard materials. A modular home meets building codes and is permanently fixed to a foundation on site.

open panel An open panel is a panelised element that consists of framing without cladding or lining. See also closed panel.

panel-based or panelised prefabrication These are units that do not enclose usable space, such as panel systems and cladding panels. They may include windows, doors or integrated services, and are either open-framing or closed-in with cladding and/or lining. They are transported to site as flat-packs. New Zealand panel-based prefabrication includes compressed timber sheet products; closed panel systems; solid timber panels; structurally insulated panels; and precast concrete panels.

plan-book or pattern-book This is a collection of house plans which can be applied to various sites.

prefab or prefabricated This term is wide open to interpretation but generally refers to on-site assembly from prefabricated components. The components are either generally available when the structure is designed or they are created specifically for the project or designed for reproduction. The term prefabricated widely refers to materials or combinations of materials prepared away from the construction site, ranging from components, panels, modules and complete buildings.

pre-nailed This refers to complex components of materials that are cut, sized or shaped and joined together using nail-plate technology. Nail-plate technology comprises engineering software, computercontrolled cutting machinery, and steel plate fasteners, as supplied by Mitek and Pryda. It is a technique commonly used for roof trusses and wall framing in traditional housing construction. Refer to component-based prefabrication and pre-engineered.

standardised Standardised building utilises components, methods or processes in which there is regularity, repetition and a background of successful practice. Standardisation is useful to gain efficiencies in prefabrication, but it does not infer standardised product or system outcomes.

standardised housing Standardised housing synonyms: *shelf design;*[7] *standard plans.* Standardised housing is housing that is not bespoke (see bespoke housing). It includes adaptations to a standard plan that does not significantly increase the costs of design and construction. It utilises components, methods or processes in which there is regularity, repetition and a background of known and successful practice.

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Appendix A Benchmarking buyer preferences for bespoke housing

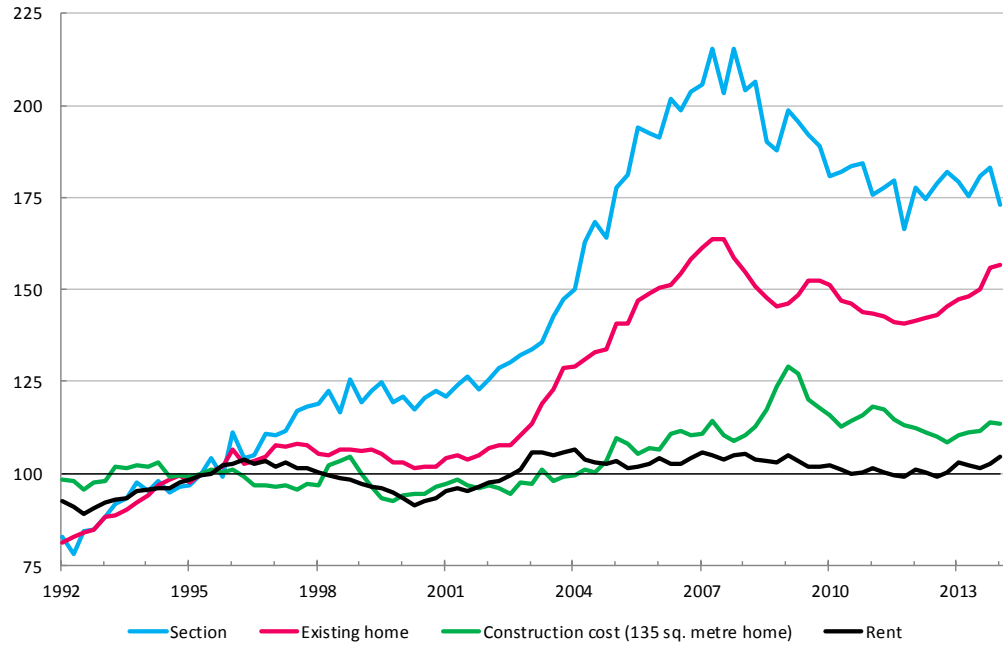
The extent of bespoke housing is associated with affluence. Houses in New Zealand, Australia, and USA are getting larger and have higher levels of finishes and tailored design. This is likely to continue. Other drivers for bespoke housing are demographic (such as building larger homes with non-standard layouts to reflect changing multi-family circumstances), and infill in sites that have various building constraints.

A.1 The New Zealand housing market

Examination of movements in section prices, existing home prices and the cost of building a home, relative to the change in household incomes, provides a useful historical context for understanding our current position. Figure 4 shows that between 1995 and today median section prices have increased 73% relative to incomes, whereas the cost of building has increased relatively little (14%). This suggests the large increase in the cost of existing homes in New Zealand (157%) is substantially driven by increases in land prices.

Figure 4 Housing costs relative to income

Changes rents, construction cost and home prices relative to income



Source: Statistics New Zealand, REINZ, NZIER

A.2 What do people want in a new house?

There is little research on what people want from a house, to what extent their preferences differ, which demand highly bespoke houses.

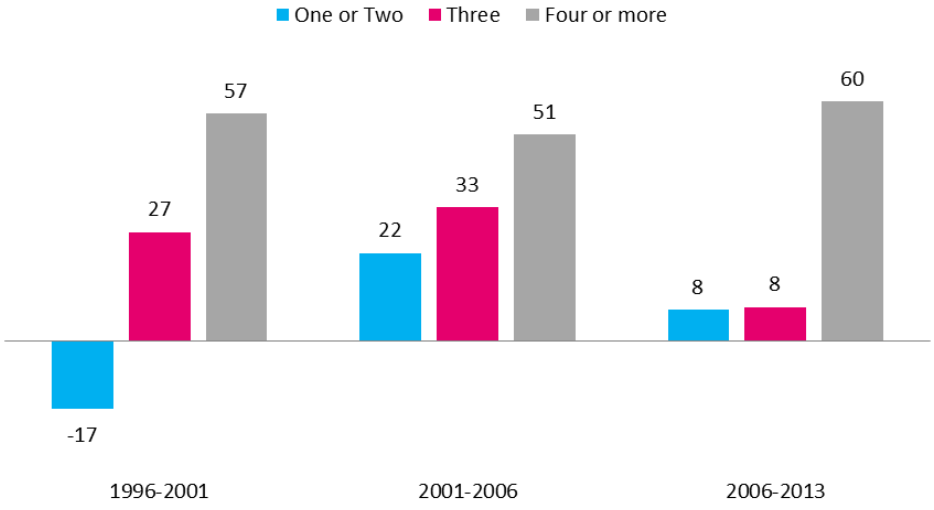
A survey of new house owners showed that provision of a double garage was a top priority in the design (BRANZ 2009[11]). The priority for a double garage was closely followed by the quality of the bathroom and kitchen fittings and finishes. Owners were aware of maintenance implications and low maintenance wall and roof claddings also scored high. This concern for reduced maintenance costs was also a feature shaping demand for new housing for several of the people we interviewed.

New owners prefer detached suburban living with a commute, rather than medium density housing nearer work. A key finding was that households are not yet generally convinced of the merits of medium density housing within existing urban limits. Finally, owners also require as much floor space as possible within their budget constraint.

The size of a home desired by people, as indicated by the number of bedrooms, has changed over the last two decades as people have modified the existing housing stock or to a lesser extent built new homes. Figure 5 shows a large increase in the number of two bedroom homes between 2001 and 2006, before falling in the last 2013 Census. The consistent area of growth is in houses with four or more bedrooms.

Figure 5 Census change in house by number of bedrooms

Change in thousands



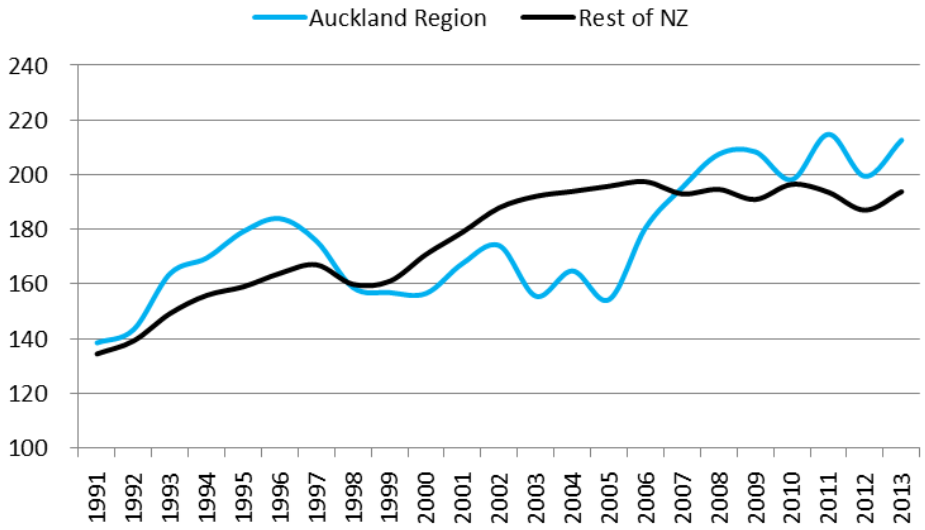
Source: Statistics New Zealand

The demand for more living space can also be seen in the expansion of the average floor space on new residential homes over time. Figure 6 shows that the average floor area of New Zealand new homes has grown from around 140 m^2 to nearly 200 m^2. In the case of Auckland, the growth in floor area dipped and then plateaued between 1998 and 2006, reflecting the pattern of people demanding more 1 and 2 bedroom units found in the Census data reported in Figure 5.

[11] BRANZ 2009 Residential Construction Costs Study

Figure 6 Average floor area

In square metres detached housing

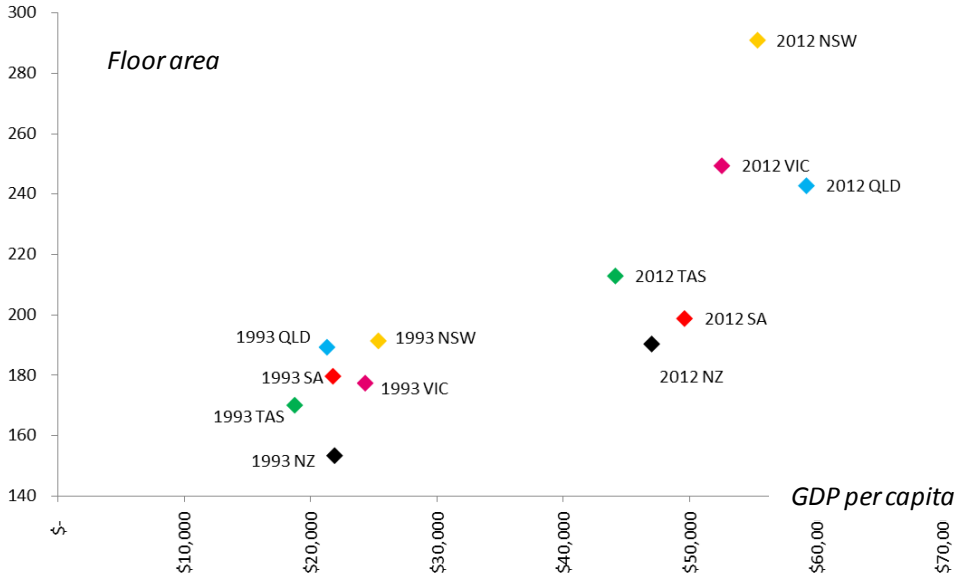


Source: Statistics New Zealand

This trend of an increasing demand for space is important because it is a good indicator of the demand for more bespoke housing. Larger homes have may have more challenges in fitting within regulated section footprints without modification. Figure 7 maps the changes in income and house floor size growth, comparing 1993 and 2012. First, note New Zealand has the lowest measured floor area in both 1993 and 2012, although it grew over the period from around 150m^2 to 200m^2. In 1993, New Zealand and Australian States were relatively tightly clustered in terms of income and floor area compared to 2012. The States that grew most in income also tended to have higher growth in floor area.

Figure 7 Income and house floor size NZ and Australia 1993 and 2012

Floor area (Vertical) in square metres; GDP per capita (Horizontal)



Source: ABS, BIS Shrapnel, Statistics New Zealand

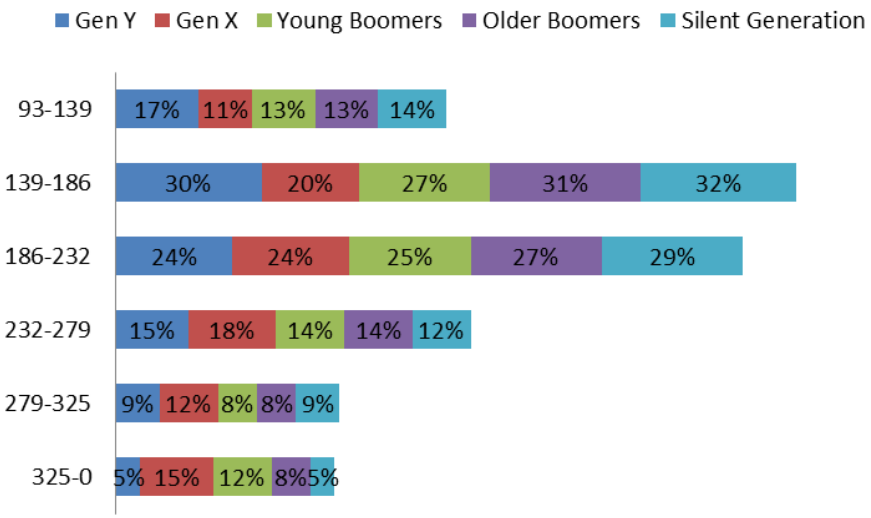
The experience of the United States and Australia both suggest that as New Zealand household income grows so will the demand for larger and more bespoke houses. There is plenty of headroom for growth in floor space should incomes increase. Or equivalently, the cost of land is reduced, effectively increasing a homebuyer's budget, should the government's affordable housing initiative succeed.

A.3 Other drivers of large bespoke housing

Information on homebuyer preferences in the United States comes from a recent survey undertaken by the National Association of Realtors.[12]

Figure 8 Median size of USA homes purchased by generation

Vertical axis square metre floor area. Gen Y medium age 29, Gen X medium age 40 Younger boomers medium age 53, Older boomers medium age 63, Silent Generation median age 72



Source: 2014 National Association of Realtors' Home Buyers and Seller Generational Trends

For all buyers, the median number of bedrooms and full bathrooms in homes purchased were three beds, and two baths. Gen Y had the highest percentage of buyers (89 percent) who purchased a home with three bedrooms or more (a median of four bedrooms), as well as the highest percentage of homes purchased with three full bathrooms or more (31 percent). The medium age of generation Y was 29, and many would be starting families. It appears this generation has a strong appetite for larger and potentially more bespoke housing.

A.3.1 Preferences for multi-generational homes

There are also more deeply rooted social changes driving demand. The Builder magazine has analysed the USA's National Realtors survey to better understand some of the drivers of buyer housing preferences. They have found that multi-generational

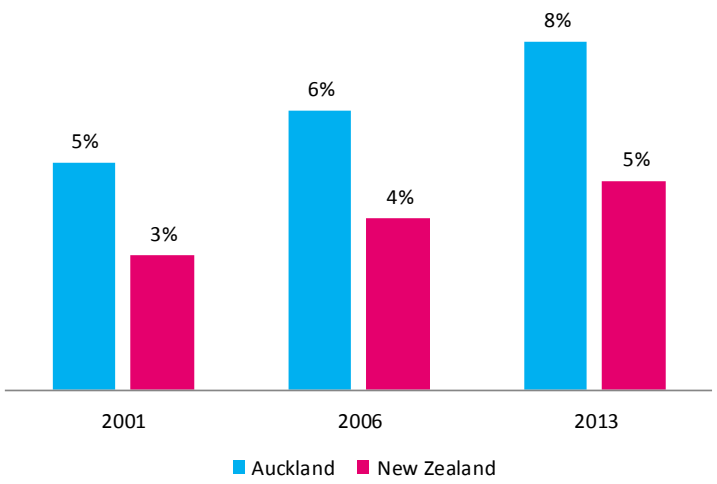
[12] 2014 National Association of Realtors, Home Buyer and Home Seller Generational Treads. This survey used a random sample weighted to be representative of sales on a geographic basis to 148,011 recent homebuyers for period covering 2012/13.

homes are gaining traction among homebuyers making up 14% of all purchases. The main drivers of their purchases were:

- 24% had children over 18 moving back home
- 24% to make financial savings
- 20% to take care of ageing parents
- 11% to spend more time with ageing parents
- 22% for other reasons.

These drivers of larger and more bespoke housing are arguably present also for New Zealand families; possibly more so for Māori and Polynesian families that tend to be larger. Figure 9 below shows that the number of multi-family households is indeed increasing in New Zealand, indicating some of the same demand drivers are present.

Figure 9 Number of multi-family households as share of family households



Source: Statistics New Zealand Census (2006)

The Builder magazine suggested that this trend makes it all the more important for builders to make 'ageing in place' options available for buyers looking for these types of homes. The same is probably true for the New Zealand market.

A.4 Conclusion

We have found that over last couple of decades that the cost of a house has significantly increased, accompanied by a substantial increase in the cost of land and the building of larger homes. Whereas, the actual cost of building has increased little. Based on analysis of the Australian and United States markets the indications are that if the cost of land reduces or incomes grow, people will demand larger more bespoke housing. There are other drivers of bespoke housing as well; in particular the need to modify homes to fit within sites, the desire for maintenance savings and need to build larger homes to reflect changing family circumstances.