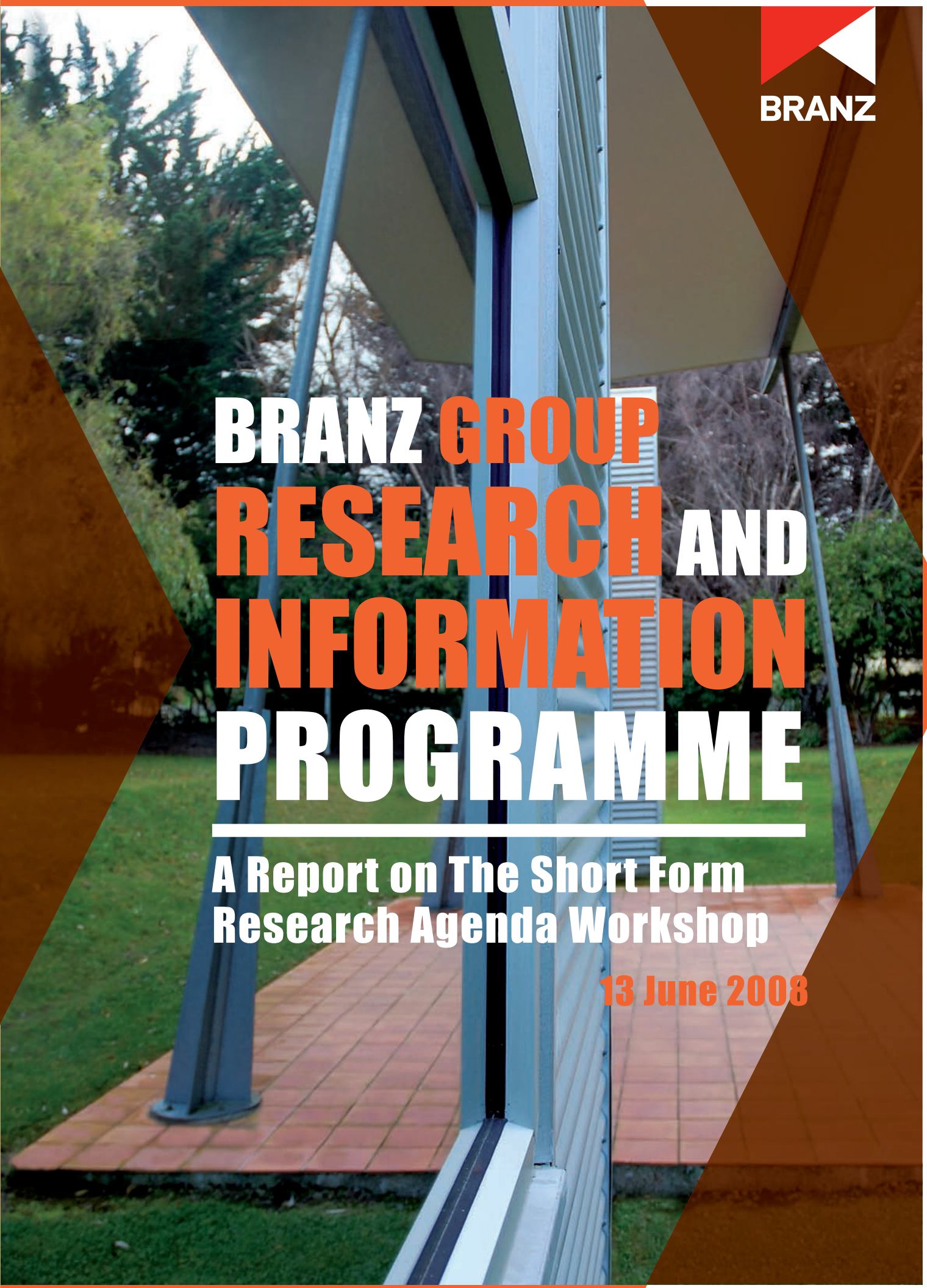

BRANZ

BRANZ GROUP RESEARCH AND INFORMATION PROGRAMME

A Report on The Short Form Research Agenda Workshop

13 June 2008

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EXECUTIVE SUMMARY

This document outlines the proposed Short Form Research Agenda (SFRA), an agenda with a five year planning horizon for research and information provision in the building and construction sector. BRANZ has initiated development of a Research Agenda for the building and construction sector. A workshop was held on Monday 12th May 2008 with recognised sector leaders and thinkers to scope high-level research and information needs and the key contents of a research agenda. The findings of this workshop contribute to the Short Form Research Agenda. This provides a stimulus and initial guide for wider sector consultation on a full research agenda, as well as an interim framework for transitioning (where needed) from existing to future research projects.

THE RESEARCH AGENDA

The context for a Research Agenda

The sector is growing in complexity while demands on building performance increase. The need for targeted research is significant, but the sector lacks consensus on its information (and hence research) requirements. Without an agenda, the most important research needs may not be addressed, so compromising control of its future and risking quality.

BRANZ is working to increase the transparency of its funded research programme. While BRANZ's role as the industry's research leader makes it a natural choice for agenda developer, it is also considered essential that the process of developing the agenda is broadly based and impartial.

A fully-developed Research Agenda would help the sector articulate its needs and pool its research resources, so ensuring its needs are met effectively and with transparency. An Agenda would also prompt collaboration towards evolving a vision, strategic roadmap and other sector management tools. Developing a research agenda carries significant and timely benefits for the sector.

Starting the process

BRANZ recognises these advantages and has initiated the preparation of a sector-wide, openly-developed programme to collaborate on a full Research Agenda (see diagram overleaf). In initial steps BRANZ has reviewed existing research commitments and emerging needs, developed an Environmental Analysis to identify potential future issues, and held a "Short Form Research Agenda" ('SFRA') scoping workshop. The proposed SFRA agenda as detailed in the following pages of this report is the result of these activities.

The SFRA proposal

The SFRA proposes that the Research Agenda for the next five years should focus on developing a **strategic model of sector capability**[1] , whilst ensuring that ongoing activities underpinning the development of the NZ building code and referenced documents continue as appropriate. A dynamic model of its operations and capabilities allows the sector to identify efficiency improvements, test different development pathways and conduct other analyses to help identify the optimal configuration with strategic options. The sector can then develop effective management procedures and tools.

Key research elements towards such a model include (in no particular order):

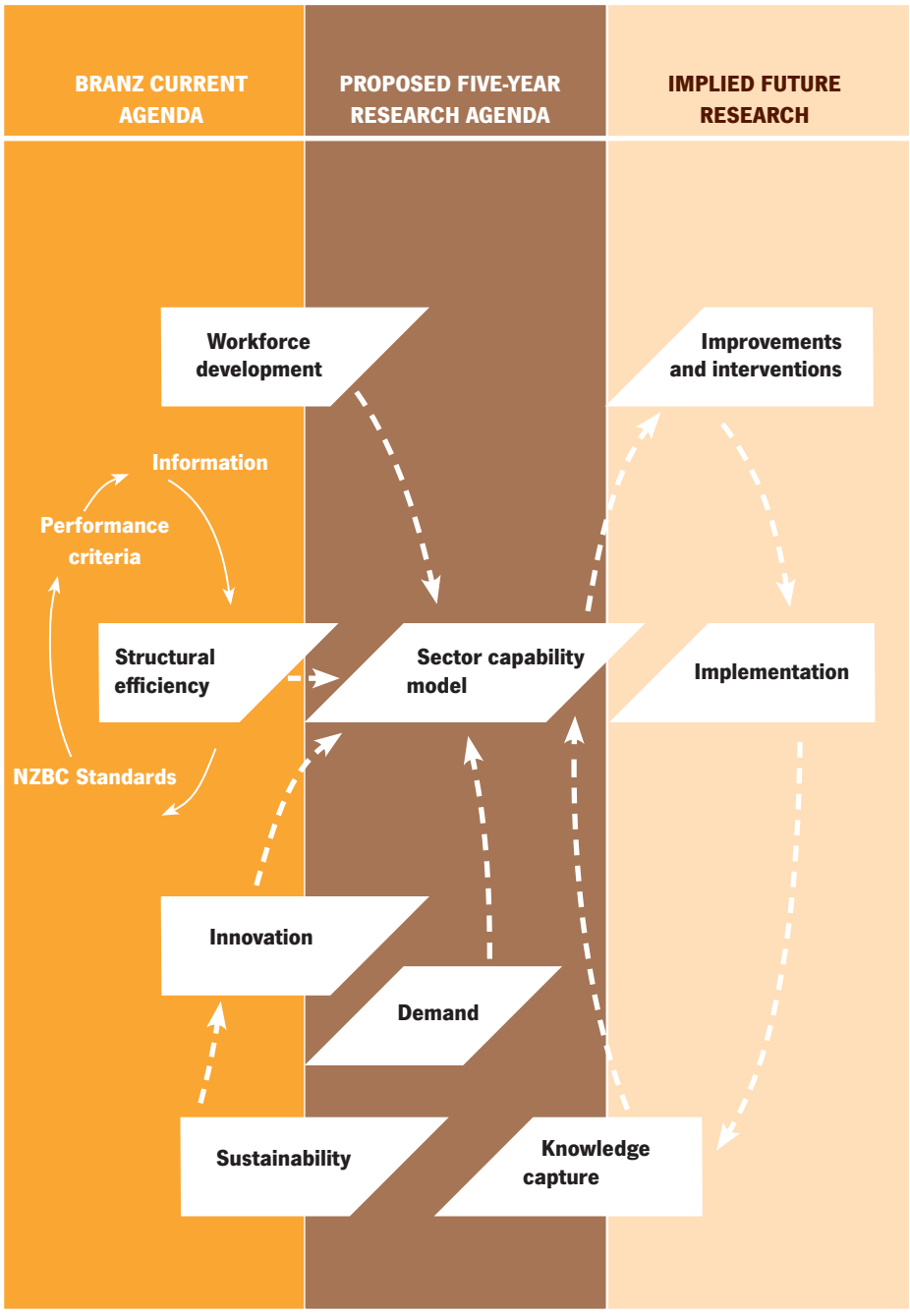
- Sustainable building (extending both conceptual developments and practical applications)
- Workforce development (including recruitment, education/training and retention of ageing expertise)
- Industry efficiency (including both value chain and standards, materials, practices and criteria such as affordability, productivity and supply chain effectiveness and flexibility)
- Demand for sustainability (across both industry and consumer)
- Innovation processes (including innovation across on-site practices, design and products/ systems)

1 Note this model may take a variety of forms and use of the term in this report does not imply a commitment to any one form at this time

Summary diagram

The diagram to the right outlines the relationships between the research items in SFRA. At the left (in the orange area) are the research themes currently associated with BRANZ – "BRANZ Current Agenda". These are driven by the need to support the ongoing development of codes and supporting standards, as a fundamental driver of both industry efficiency and public health and safety. At the centre (in the brown area – "Proposed Five-Year Research Agenda") is the proposed Sector Capability Model, with inputs from sustainable building (via innovation), workforce development, structural (industry structure) efficiency and demand for innovations. At the right (in cream) – Implied Future Research are future research themes implied by full use of a Sector Capability Model, and if implemented there would need to be an ongoing process of revision and updating (as BRANZ would ordinarily look to do as part of its work programme).

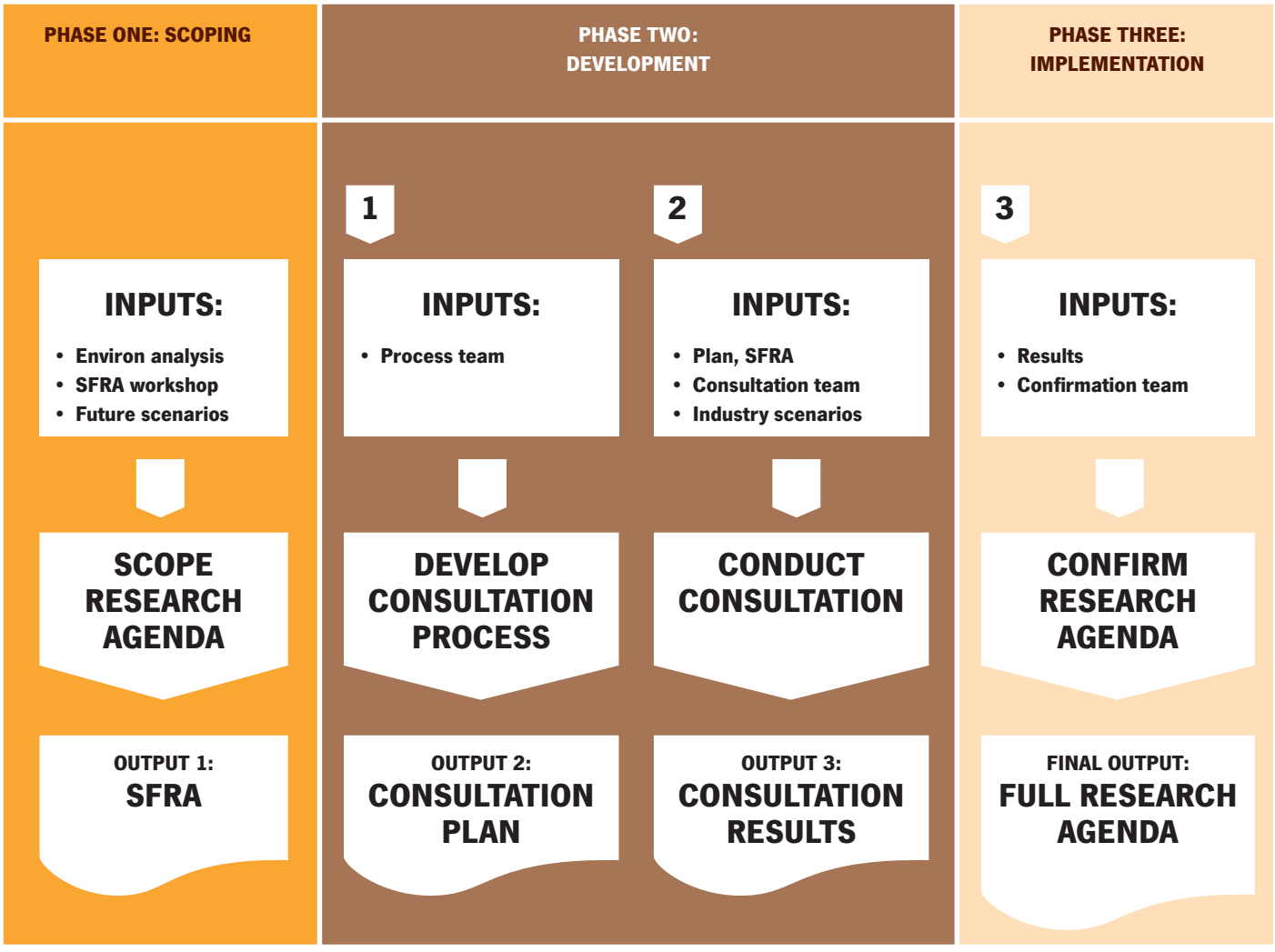
To ease understanding of the diagram, it should be read from left to right. The current research will continue to support codes and standards development, whilst concurrently new work is needed to understand how the industry operates and where changes could be made to improve the industry's capability to efficiently, effectively and affordably deliver the built environment. This model (in whatever form it takes) might then act as a base for interventions which would themselves require codes, standards, and performance-based iteration.



The next step

The diagram below outlines the three phases of the full Vision and Research Agenda. Note the SFRA workshop occurs in Phase One but contributes in Phase Two, alongside BRANZ's Environmental Analysis and Future Scenario work. Subsequent Phases have yet to be finalised.

The report that follows details the workshop results leading to development of the output presented here and summary diagram above.



THE WORKSHOP

Background

BRANZ has initiated development of a Short Form Research Agenda ('SFRA') for the building and construction sector. A half-day workshop was held on Monday 12th May 2008 in Wellington with sector leaders to scope high-level research and information needs and thus the key contents of a research agenda. The findings of this workshop contribute to the development of the SFRA. This provides an interim framework for transitioning from existing to future research projects, as well as a stimulus and initial guide for wider sector consultation on a full research agenda .

Method

Sector leaders were identified across a range of specialisations including construction, manufacturing, trades, retail, design, policy, research, research funding and compliance. Invitation letters were sent explaining the context and rationale for the workshop, and providing the questions that would be explored.

The workshop was designed to stimulate thinking and strategic discussion. That is, it was designed to brainstorm and scope high-level thinking. Brevity and intensity were thus important to ensuring the free flow of ideas that would provide a high-level overview of the context and drivers for research. A secondary aim was also to discourage debate over specific points before a consensus on core issues had been developed.

The session began with an outline of the SFRA's context by workshop organiser Chris Kane, indicating the importance of the workshop in starting the Research Agenda process and providing a guide and stimulus for future consultation. Future scenario specialist Susan Bates then briefly presented recent results of her work to help stimulate strategic perspectives.

A series of sub-group discussions were then held to help develop a future-oriented strategic context for the Research Agenda. The discussion subjects were 'outcomes by 2025', 'strategies to achieve 2025 outcomes', 'programmes to implement strategies', 'research themes to support programmes to 2015' and 'specific research questions for the next five years'. The 2025 horizon was chosen as the approximate time current research would take to feed through into specific innovations (such as in standards, materials, systems, practices) and so ultimately through to sector-wide outcomes at the longer horizon.

For each outcome, attendees were asked to specify 1 – 3 pivotal subjects – those that were essential to progress. While this approach reduced the richness of possible insights it ensured the workshop remained focused on central/critical insights in the first instance. A much fuller understanding of the sector's future and research needs will be developed in the broader Research Agenda Development process over the next year.

Attendees

Attendees at the session were:

Stephen McKernon, Supplejack, workshop Facilitator

Chris Kane, BRANZ, workshop organiser

Susan Bates, Beagle Consulting, workshop presenter

Kay Saville-Smith, CRESA

Chris Wood, Ministry for the Environment

Paul Shortis, BRANZ

Nick Collins, Beacon Pathway

Kevin Golding, Winstone Wallboards

Mike Stannard, Department of Building and Housing

Graham Moor, NZ Roofing Association

Bob Deleur, Auckland City Council

Adrian Bennett, Building Research

Ruth Berry, Foundation for Research, Science and Technology

Pieter Burghout, Registered Master Builders Federation

Jane Cuming, Placemakers

Note the workshop findings below are presented without speaker attributions. This allowed individuals to raise issues that might be considered controversial or sensitive with relative anonymity.

Definitions

In the workshop the terms 'industry' and 'sector' were used interchangeably. This report uses the term 'sector' unless quoting attendees to denote the whole – spanning commercial, government and residential sub-sectors and both consumer/user and business interests.

Reading this report

The report that follows describes the context and outputs of the SFRA workshop. It begins by directing the reader to an appendix summarising a background review of existing and emerging research conducted by BRANZ, as part of its own internal process. It then details the workshop process and outputs, and finishes with development of a summary diagram to help communicate results.

Note that the workshop and this report are designed to scope, stimulate and guide discussion of a sectoral vision and ultimately much broader and deeper research agenda. It is not intended to foreclose debate about its contents or addition of new material to the final vision and research agenda. This document should be regarded as the first stake in the ground to underpin the larger conversation.

WORKSHOP RESULTS

The results are provided below in the order of their development so that readers understand the future/strategic context for the research topics nominated for the next five years. These are reproduced as captured, for the benefit of the attendees' review.

1. Desired Outcomes by 2025

- Attendees were first asked to brainstorm outcomes desired for the sector by 2025. They were then asked to pick the pivotal ones, as below.

Pivotal

- Building flexibility and industry flexibility - building flexibility [depends on] industry flexibility
- Valuing built as much as natural - sector seen as a full member of NZ's economy and society (across the value chain)
- Sustainability mainstreamed - sustainability is part of how things are done, not a separate initiative

Others

- Sector needs to be integrated member of broader groups – community, neighbourhood, transport
- Meets household needs in quality of buildings and in self-sustaining industry
- The sector needs to provide leadership – proactive, respected
- Credibility
- Proper working model of industry
- Buildings people want – need for metrics
- Meets the requirements of society
- Change is a key factor [in requiring] building flexibility and meeting diverse needs

- Need for multi-use buildings
- Meet the drivers (societal) of the time e.g. intensification
- Responsive to increasing technology demands and change
- Ageing in place
- Built environment supports productivity of the nation
- Sector is sustainable [across] economic, social and environmental
- Confidence in supply of products [eg quality of imports]
- Economic balance, confidence for sector in future work volumes
- Cultural diversity valued and catered for
- Educated construction force

Discussion of the pivotal outcomes indicated 'valuing the built environment' might be central and others might derive from or be included in it.

Note there was also some discussion during the workshop about the central role of a sector vision in building consensus and enabling better sector management. It is possible to envisage a number of sector visions based on these desired outcomes. Three examples are provided in the boxes below.

The sector is valued as a full member of NZ's economy and society

The sector's sustainability has been adopted by mainstream NZers and impacted positively on quality of life in NZ

The sector's flexibility ensures buildings respond flexibly to society's needs

In summary, a core outcome is that the sector will be highly valued for contributing to the quality of life in New Zealand. Related outcomes are sector flexibility and sustainability. The next section highlights how these outcomes could be approached.

2. Strategies to achieve 2025 outcomes

Attendees were then asked to brainstorm strategies that would help deliver the pivotal outcomes above. They were then asked to pick the pivotal strategies, as below.

Pivotal

- Change people in industry (those recruited as well as through training/ education) [and] determine barriers [so as] to design [greater] flexibility
- Lead by example and build motives for using best practice – at any level, so that best practice becomes the motivator across the value chain and all types of construction
- Mindset change to lean consumption/ economics – 'more for less'

Others

- Building level of knowledge about the value of sector – information, education
- Connect value of that to performance the industry can deliver on
- Thread of innovation so that you're anticipating new things
- Broader measures to appropriate projects
- Fundamental design need to accommodate future (unknown) change
- Marked change to reflect lifetime value of (differing) building uses (links into sustainability)
- Industry needs to adapt [and so people

need] continuing education. [An industry of] thinkers not doers.

- Changes to legislation, code, standards. Issues around sharing best practice.
- Make buildings resourceful, efficient
- Lean consumption, lean economics [e.g.] energy efficiency, orientation [?] without loss of amenity

In summary, the above strategies point towards the need to direct and manage profound changes in the sector. The next section highlights how these strategies might be implemented.

3. Programmes to implement strategies for 2025

Attendees were then asked to brainstorm programmes required to implement the pivotal strategies above. They were then asked to pick the pivotal programmes, as below.

Pivotal

- 'Thinkers not just builders' – build sector capability model (whole sector approach) and (1) measure against future (2) recruit practical thinkers, (3) build in continuous improvement
- Using Government procurement to lead by example (drive choices) – no need to legislate, just say 'we want it this way'
- Communicate crisis/urgency – [build] perception of crisis [such as] pending energy [and other resource] shortages (such as water in Australia), then benchmark resource efficiency and educate

Others

- Provide evaluation tools to procurers
- Investment in technologies, knowledge, capacity in industry
- Transparency around cost, performance
- Remove bureaucratic obstacles
- Use consumer power - generate mainstream demand and so engage small builders and individual practitioners
- Sector capability model [means] measure, then manage [so resulting in] improvements
- Change recruiting model across sector [and so] change training
- Bring best practice (international) into NZ and develop unique methodologies
- Builders become factory-based?

Benchmark of resource efficiency

- Understanding current situation [such as what's the] truth, [appropriate] KPIs, measurement
- Education programme [that helps] understand knowledge transfer
- Consideration of whole of life [including] resource generator and use of home (for office/ business, lifestyle)
- Market transformation [and its] implementation

In summary, the above programmes point towards the need to create and communicate new values within the sector such that profound sector change becomes possible. The next section highlights what research themes would need to be explored to support such programmes.

4. Research themes to support programmes to 2015

Attendees were then asked to brainstorm research themes required to support the pivotal programmes. They were then asked to pick the pivotal themes, as below.

Pivotal

- Understanding industry capability and in particular the industry model – [develop a capability] model
- Understanding efficiency – [develop a] model of (a) where bottlenecks are, (b) how improvements can be targeted,(c) how the model can be further segmented
- Capability to deliver sustainable buildings, [including] (a) how does contracting occur? (b) how does (all) training contribute? (c) what feedback mechanisms exist?

Others

- Sustainable building [includes] health, capability [as above, and] what is relationship to affordability?
- Value of industry impacts [including] (a) not just GDP, (b) non-cash benefits, (c) influence on social wellbeing (d) training of NZers – how does industry contribute, (e) what is industry contribution to international markets (i.e. design-led stuff), (f) economic transformation, (g) why is industry so inflexible [and in particular] what is its culture?
- What capabilities does the sector need?
- What is the current industry model like (wiring diagram)?
- Skills/ participant shortage - if the sector can't get people into the industry it can't solve the skill need
- Sustainability [in both] materials and their physics/performance
- Productivity
- Affordability
- Life-time value of building
- Knowledge transfer
- Maintaining core capability in research [in relation to] core technical requirements

In summary, the above themes point towards the need for a robust strategic overview of the sector, and in particular, development of a model to be able to understand how the sector works and how it can be improved.

The next section highlights the specific research questions that would need to be answered to support such a modelling exercise.

Checking BRANZ's review of current and emerging research themes

Prior to the workshop BRANZ had reviewed current and emerging research themes and developed a shortlist. This is detailed in 'Appendix One: BRANZ review of existing and emerging research themes.

A summary of themes identified in this review was discussed at the end of the workshop. Post-workshop implications are presented below. The table shows BRANZ themes against the three pivotal themes identified in the workshop.

This initial analysis suggests BRANZ themes are accurate but could be re-grouped and re-named to better represent the sector's pivotal concerns at this time. In particular, themes of 'workforce development' (intersecting with 'people in industry' and 'demographics') and 'demand' (intersecting with 'affordability', 'demographics' and 'supply of information') might be worth considering (see research questions in next section).

Discussion of BRANZ's themes prompted attendees to raise the issues below for further review.

- Impact of globalisation (materials/ importing)
- Unintended consequences of change
- Medium density housing quality and integration with community
- Climate change and resilience of cities given coastal/ floodplain/ volcanic locations

- Snapshots/ monitoring of product quality (viz imports)
- Growing own building materials (bio-mimicry)
- Building site collaboration and innovation
- Transfer of innovations from site to industry

In summary, the pivotal themes identified in the workshop point to a strategic need for research to understand and improve sector capability. One consequence is fuller recognition of the value of emerging research themes.

BRANZ ITEMS	WORKSHOP THEMES		
	Understanding industry capability	**Understanding efficiency**	**Capability to deliver sustainable buildings**
People in industry			✓
Structure of industry	✓	✓	
Existing building stock			✓
Sustainability			✓
Affordability		✓	
Supply of information	✓		✓
Demographics			✓
Impact of technology/ innovation	✓		✓

5. Specific research topics for the next five years

Finally, attendees were asked to brainstorm the specific research questions that would need to be asked over the next five years to support development of a sector capability model. Because so many questions were developed, they were not asked to pick the pivotal questions as in previous exercises.

For the sake of clarity these were grouped after the workshop to relate questions to themes. Questions in italics are those arising from discussion of BRANZ's review (see Appendix). Obviously, the questions may be grouped in other ways and the aim here is to organise them in ways consistent with other outputs of the workshop.

a. Researching industry capability

How can we construct a "dummy" industry capability model to model our future using elements such as (a) supply chain, (b) value chain, (c) legislative/regulatory environment and drivers, (d) demographics and macro changes, (e) product development cycles and understanding?

How can we evaluate this "dummy" sector capability model? [We could ask] (a) what can international research tell us, and of this (b) what is transferable to NZ, and (c) what can be adapted to NZ?

How can we maintain and expand our core capability? Some questions are (a) what's going on (and understanding capability), (b) what needs to be done (and the capacity for this) to maintain code, standards and industry needs, and (c) how can we capture (semi-)unique knowledge?

What is the impact of globalisation (such as through materials/ importing) on capability?

What are the unintended consequences of change in the sector – and their impacts on capability/ sustainability?

b. Researching innovation

How does building site collaboration and innovation work?

How can on-site innovations be transferred effectively to the wider industry?

c. Researching structural efficiency

How can we understand the efficiency (with metrics) of the way we build at the moment [and so] what are the opportunities to improve it (such as through lean manufacturing)?

How can we benchmark our performance (eg against Australia)?

What are the values associated with modular prefabricated building (and who values them)?

What are the incentives/ disincentives within the value chain to change behavior?

What is relationship of efficiency to productivity?

How can the sector develop appropriate snapshots/ monitoring of product quality (viz imports)?

d. Researching capability to deliver sustainable buildings

Concept development

What is relationship of sustainability to affordability?

What is the relationship between dwelling and site (not well done now)?

What is the tension between whole-of-life (sustainability) and green claims for materials?

What is relationship of sustainability to productivity?

What is the relationship between climate change and the resilience of NZ cities given their frequent coastal/ floodplain/ volcanic locations? How can their resilience be protected/ improved?

What are the unintended consequences of change in the sector – and their impacts on capability/ sustainability?

Buildings/ standards/ materials

How well do our buildings facilitate flexibility of use over their lifetime (such as a building that is initially an office block and becomes a 1-bedroom apartment and then a family home)?

How do we deliver healthy building – models, standards, products etc

What standard(s) are in place for rebuilding houses (more sustainable than tearing down)?

Existing stock – what capability exists to deliver to (say) NZBCSD retrofit stuff?

What is capability to renew/ retrofit houses with sustainability features?

What are the relationships and communications across the value chain that contribute to/inhibit high performance in delivering sustainable buildings?

What are the appropriate standards for medium density housing quality and how should this housing be integrated with the wider community?

How can the sector develop a programme for growing its own building materials (bio-mimicry – ie following nature, such as growing buildings like coral build reefs)?

e. Understanding demand

What do people want from their houses?

How do people learn to value whole-of-life?

How is the concept of the house changing, such as evolving a work-from-home dimension (or the increasing single-person and one-child household)?

Neighbourhood design - [how can we design neighbourhoods] to reduce travel to work/ school?

f. Understanding workforce development

What is the implication of ageing within the industry over the next 15 years?

[What are the] career path opportunities/ options?

[How can the sector address the] undervaluation of people [as a result of] boom/bust [cycles]?

How do you pull people through different levels [of expertise, from lower to higher]?

How do we maintain core capability within research?

Closing discussion and questions

The workshop finished with a discussion of the strategic and research issues raised during the workshop. Three key questions were explored and attendees made suggestions, as below.

How will BRANZ ensure engagement/ collaboration/ownership by industry in broader process?

Set up web wiki/base it on the web?

Ensure widespread industry circulation across all levels/sub-industries.

Actually take out to industry to build critical mass

How will BRANZ use results of workshop?

Provide document to start next phase and let this document evolve.

What is the sector's vision?

Look at integrating Foresight exercise.

Look at evaluating effectiveness of past research.

Look at developing leadership.

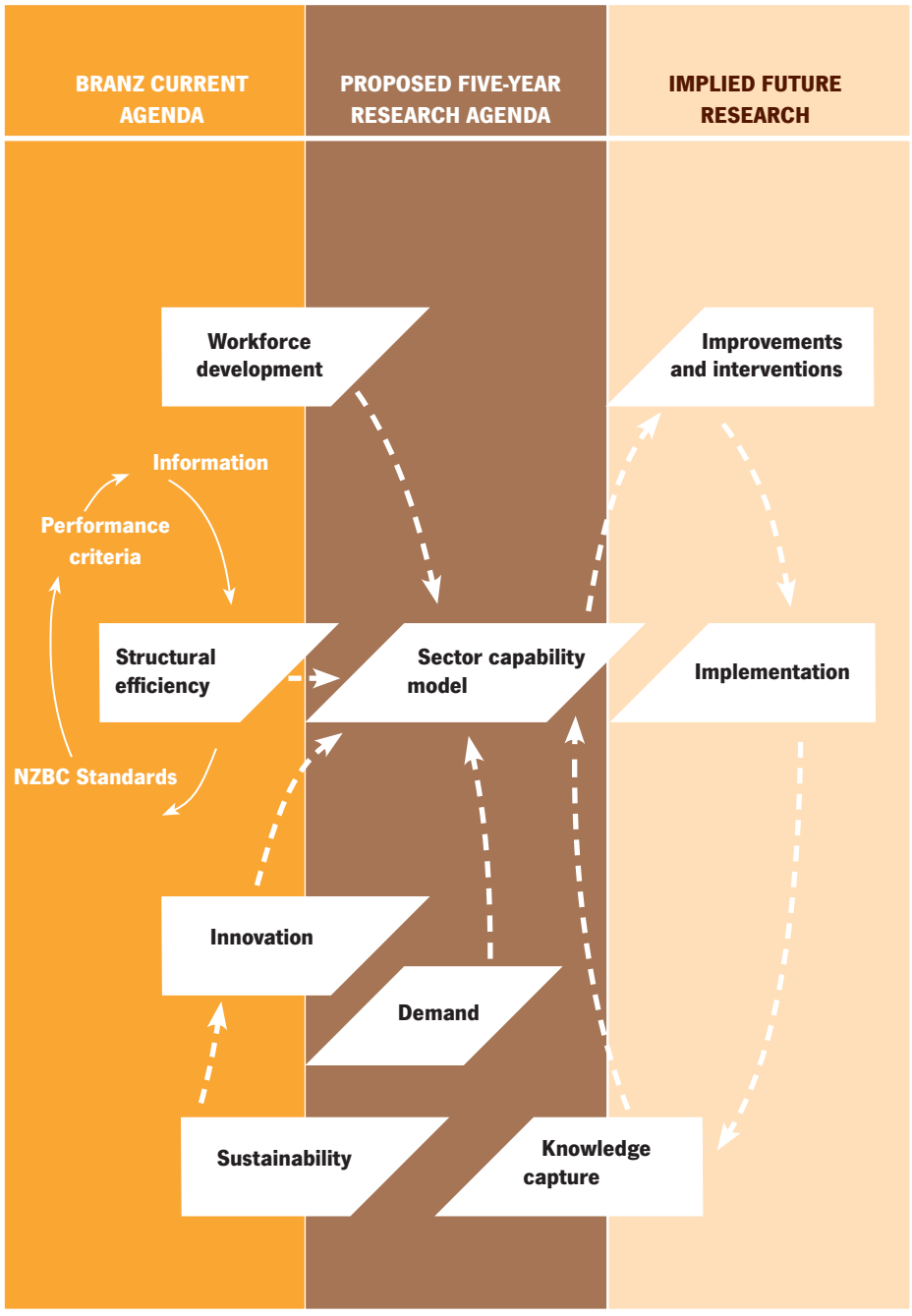
Development of a summary diagram

The diagram at right was developed after the workshop to help communicate workshop outputs. It summarises key research themes for the next five years in visual form, and in particular, outlines overall relationships between the research themes in the SFRA.

At the left (in the orange area) are the research themes and topics BRANZ has been associated with historically (though this does not describe the full extent of its work).

At the centre (in the brown area – "Proposed Five-Year Research Agenda") is the Sector Capability Model surrounded by the other themes identified in the workshop. These are visualised as inputs to the Model, namely from sustainable building (via innovation), workforce development, structural efficiency and demand. Other relationships between these themes are not shown for simplicity, and the diagram is by no means a final version.

Note that 'innovation' and 'workforce development' have been inserted in the diagram as separate themes, though they were not considered pivotal. Innovation was inserted partly because it was raised in research questions in its own right. An additional workshop insight was that sustainability is currently a key driver of innovation but others could take its place within the next decade if/when sustainability becomes fully embedded in the sector. Workforce development was inserted because it is a strong theme in the questions.



Other themes currently listed under those shown above are 'demographics' (e.g. ageing workforce/ population), 'supply of information' and 'value chain'. As noted, this is not a final diagram and it can be evolved as need be.

Future research themes implied by development of a Sector Capability Model are included at right, including studies to identify key improvements interventions, the effectiveness of implementation, and the resulting dynamics of sector learning and knowledge capture. The assumption is that results from these various studies would be used to enrich the sector capability model.

Appendix one

BRANZ Review of Existing and Emerging Research Themes

As part of its role as the sector's primary research provider, BRANZ constantly monitors trends in the construction sector to ensure that the information delivered helps the sector to solve current problems and gear up to solve future ones.

Additionally, it is important to be able to anticipate future needs, to support them with the required knowledge. That knowledge often does not yet exist and needs to be created by research. The process by which this is done leads to the creation of BRANZ's annual research agenda.

Experience has shown that in asking for input to this process, today's problems often appear far larger than they would be if seen from some future time (when they are solved and the sector is wrestling with something new).

Research themes for 2008/09

BRANZ's review suggests the sector's research needs for the 2008/9 research year are as outlined in the themes below. These themes were distilled from numerous sources of information (including the current BRANZ research programme, the codes and standards support activities, Industry Helpline logs, and the regular Industry Needs Survey) and are carried forward into the "checklist" at the end of this document. A more comprehensive review can be found on the BRANZ website[1]. A cut-down version of this larger review is presented at right in the summary table.

People in the Sector

This research theme underpins the ability of the sector to deliver the built environment. The sector employs more than 7% of the workforce in NZ, in construction and related industries. It links with the "Structure of the Sector" theme below.

Lack of skills and capacity has been identified as one of the issues leading to the weathertightness problem. The cyclic nature of the economy and

1 After July 31 2008

PRIORITY	RESEARCH AREA	SPECIFIC RESEARCH NEEDED
1	**Indoor moisture and environmental quality**	Our buildings affect our health and productivity. Only a small amount of the understanding needed to design-in health and wellbeing currently exists around the world, some of it resident at BRANZ. • Establish an engineering basis for the moisture performance of buildings while we have appropriate staff and skills to do it. Failure to finish the job could see the industry drive into another leaking building - sized problem because it could not understand the consequences of new materials and space conditioning on the hygrothermal performance of building walls and roofs etc.
2	**Sustainable Materials**	Any impact-based specification system requires fundamental information on the performance and attributes of the systems and/or materials being classified for specification. • Establish baseline information to underpin LCA and LCI analyses of building materials and systems.
3	**Sector Capability**	The industry is a complex system which provides the infrastructure that underpins much of the economic backbone of NZ • Understand the complex interrelationships between the drivers of the industry, to prepare for major disruptors such as weathertightness, an oil shock or a seismic event, and provide self-awareness of the means of managing the boom-bust cycle • Understand the role of the sector's wider interrelationships to underpin new approaches to contract and site management • To what extent and at what rate are external innovations such as new systems, processes and tools adopted by the sector (from on-site practitioners to corporate constructors)?
4	**Resource Efficiency**	As energy becomes more expensive, any reticulated service (such as electricity, water, sewage) which is dependent on the supply or use of energy will become similarly so. • Understand how buildings and communities can be holistically designed to minimise resource usage.
5	**Existing Buildings**	Any national-level results from the improvement of the built environment must include buildings that already exist, yet the only realistic pathway to enact these improvements is via customer demand. • By what means can the sector create this demand, thereby improving the NZ built environment and what barriers exist in regulatory or practice norms to this happening?

consequent boom/bust cycles make it difficult to retain qualified and experienced staff. Provisions for licensing building practitioners in the Building Act may also place an additional burden on the sector for the next five to eight years whilst they are bedded in. Many older workers are likely to retire or choose not to become licensed and training organisations will struggle to put through the numbers of trainees required. It is anticipated that the initial competence screening will acknowledge these difficulties and will focus on assessment of experience rather than demanding technical qualifications.

Structures for the licensing of building practitioners have been put in place, but these are currently of a voluntary nature. Significant push-back from sector bodies is combining with a degree of political sensitivity) to delay the implementation of this part of the public confidence structure.

Structure of the Sector

The built environment represents a national investment valued at over $280 billion, provides the infrastructure that is essential for the rest of the economy to function and is the mainstay of community life. The sector is split between a relatively small number of large businesses (typically manufacturers, distributors and construction companies) and a large number of small and medium sized businesses (typically designers, builders and sub-trades). Statistics NZ figures show approximately 40,000 enterprises in the construction sector. The property services sector has approximately 68,000 enterprises. There are also manufacturing industries which directly support the construction sector.

The sector has traditionally operated on a tender basis for contracts which have been let at a fixed price, often with the result that the lowest tender will win. New operating concepts have been trialled both in NZ and the USA/UK which would change this approach if adopted more widely, either increasing profitability or creating better/more buildings for the same spend. In considering these new approaches, it is apparent that gaps in current understanding of how the sector works prevent an "apples for apples" comparison. Estimates of the sector's contribution to GDP vary, and can not be easily constructed from Statistics NZ raw data as the value flows are hard to establish (construction and in-service value are very different attributes).

Existing Building Stock

One statistic dominates in this theme: at least 80% of the buildings which will exist in 2025 already exist. Therefore, attempts to change the quality of life for building occupants, or the quality of the buildings themselves for any other reason via the building code, are unlikely to meet with wide success. The existing building stock is also the source of renovation and alterations work during times of sector recession, and so is clearly a critical part of the sector's target market. Beacon Pathway figures from 2005 suggested the size of the DIY/renovation market is of the order of $6b.

The drivers for activity in the existing buildings area are market-centric rather than regulator-driven. Whilst there is growing political will to ensure that NZ houses (especially) are healthy, resource efficient and safe, politicians are reluctant to mandate change, preferring instead to leave it to incentive programmes such as EECA's Solar Hot Water Grants Scheme or similar programmes. From the perspective of some sub-sectors, such as manufacturing, significant consumer pull (such as for heat pumps) would drive substantial product sales. The major issue is then how to create that consumer pull.

Sustainability

Amongst the international community there is a growing belief that we are using the earth's resources at an unsustainable rate. There is a growing awareness of sustainability driven by recognition of the role of human activity on climate change and subsequent international initiatives like the Kyoto Protocol. Consumer interest in sustainability will increase further driven by rising energy prices (including petrol), Government initiatives such as Govt3 and the inclusion of sustainability concepts in the Building Act. This will pressure the sector to provide effective and affordable solutions to meet these needs.

One approach to reducing housing's effects on the environment is to limit urban sprawl in new residential developments by increasing the density of dwellings, particularly with the use of multi-residential buildings. However, a CHRANZ study (2005) showed most people aspired to live in larger detached dwellings on large sections and this will be a hurdle that must be overcome. A following BRANZ study on changing housing needs (Page, 2007) reinforced this conclusion, and added the observation that even the new homes consumers were buying often did not meet their needs (as assessed by them).

Sustainability has taken on a "life of its own" as a political and marketing force – most of the public understanding of the term centres around environmental footprint aspects and little overt

attention has been paid to the economic or social dimensions of sustainability philosophy. The current review of the building code is considering means of implementing sustainability into the code, suggesting that at some point in the future all decisions would need to be made with respect to a "footprint" measure of the decision's consequences (i.e. which material is best for the intended life of the building, which design will give lower operating resource usage, and so on). The reason that this has not been implemented is the majority of the supporting information which would be needed to make such decisions in a transparent manner does not exist. It will need to be created by research.

Similarly, within the social dimension of sustainability, the safety of people constructing and using buildings needs to be considered, as does occupant health and productivity. Consumers expect their buildings to be safe and healthy and fit for purpose. They expect all NZBC compliance issues to be resolved by the design and construction process prior to occupation of the building. As the population ages, more emphasis will be placed on the provision of health and safety of housing and access will become an important issue. This will also flow through into existing buildings which are largely designed with the first owner in mind and do not generally provide accessibility for aged or disabled occupants.

A clear indicator to BRANZ of future research needs is that building occupants are also becoming increasingly aware of the effect of the indoor environment on health. Indoor moisture, air quality, moulds and dust-mites are all recognised as having adverse effects on health. As existing weathertightness and building moisture programmes wind down, the background issue of health (with its drivers indoor ventilation and moisture) is increasingly apparent. Previous work by BRANZ and others shows that the health of a home's occupants is a function of the indoor environment of the building. As yet there is no clear understanding of how to "design in" occupant health. BRANZ currently has the infrastructure and resources to tackle this indoor moisture issue and will be pushing to begin this in the coming year.

The issue of public health and safety is at the crossover point between consumer and Code drivers – it was the original founding intent of the Building Act in 1992. In considering the importance of these issues to informing a research agenda, experience has shown very clearly that a large fatal fire, tidal wave, earthquake or cyclone very quickly acts to redefine what should be considered as "priority" research activities. Put another way, it is important that the research being done on within the sector on natural hazards be able to pass the "front page test" in the wake of such a disaster.

The nature of sustainability means that it is a catch-all for various otherwise separately stated drivers of future research. It is also very much the "in thing" at the time of writing. If sustainability is treated as an example of one among many possible sector disruptors, it is clear the sector will deal with any range of future disruptors in similar ways. Put another way, in 30 years time it is probable "sustainability" will be a spent force, replaced several times over by issues of greater importance. For example, indoor environmental quality has been treated above as a subset of sustainability. It may later emerge as the key driver of increased national productivity as the majority of "work" takes place indoors. This also raises the issue of "green construction" versus "green operation", underpinning the long-term nature of the built environment and the potential for carefully laid operational attributes to be disrupted by a later change of use .

Affordability

Affordability is one of the key drivers affecting consumers. It affects the location, size and quality of the buildings they purchase. Affordability is perceived to be decreasing rapidly and the home ownership level (a lead indicator watched closely by numerous governmental agencies from Immigration and Treasury to the Retirement Commission) is expected to drop from 68% and rental demand to increase. Consumer investment timeframes are generally short (approximately seven years for housing – often less for commercial construction) and they appear unprepared to invest in features or services unless the benefits of these are realised during their tenure (even those enhancing their experience of living in their home or produce net business savings).

There are clear links in the affordability debate to attributes of sustainability raised in the building code review – up-front cost vs whole of life cost, and potential market strategies for encouraging investment on a whole-of life basis.

Many behaviours driving the current market (such as larger homes for fewer occupants) are probably unsustainable in the medium term as costs have outstripped demand. The current "bubble burst" lends weight to this. As the government moves to investigate how it can influence affordability, new market dynamics may be created. From a research agenda perspective, a question that may be asked is "how will this influence supply and

demand, and what information will be needed to stay ahead of the curve"?

Supply of Information

This is a major area of interest in establishing a research agenda, as it comprises two intersecting activities. First, providing a framework for the identification and creation of new knowledge is the role of this short-form agenda overall. Second, the pathways by which new research knowledge finds its way to practitioners, central and local government, suppliers, and others within the sector are constantly changing. The rapid pace of technological change and uptake is contributing to this.

As a result there is a need for investigation into the best means to reach some parts of the sector with important new knowledge. For example, in times of change and subsequent information overload, how do builders learn what they need to know without losing productive time?

In parallel, the current process by which building consents are issued is very paper-centric. In view of emergent specification tools and greatly enhanced CAD capability, are there means by which this process can be streamlined via the use of technology?

The challenge in setting this and subsequent research agendas is to balance the future possibilities of the knowledge needed with how it will be delivered. Neither is fixed.

Impact of Technology and Innovation

In classical research terms, this is the classification for high technical risk investigations which may produce unexpected results. As an example, BRANZ's now-concluded HEEP programme began as a series of investigations to determine whether it was actually possible to monitor all forms of energy used in homes – requiring several new techniques and in some cases entirely new technology to be developed.

The technology influence (noted above) on information dissemination will involve a number of blind alleys before the final combinations of technology and information structures are chosen. In the formative stages, this is a significant research activity.

Similarly, establishing means of measuring ("sensing") the performance of buildings remotely is another area in which the potential payback is high (no more hidden degradation, for example). But achieving reliable systems for doing this is a venture that carries a risk of technical failure.

BRANZ's Current Research Programme

BRANZ's primary research and information focus is providing the sector with means to build that comply with the building code. About 60% of research is directed to making sure the code (and related referenced standards) is factually–based in science and engineering, so as to ensure that our buildings are safe, durable and healthy.

The overall research programme for 2008-onwards can be seen at **www.branz.co.nz**[2]. This gives the current research programme and indiactes where the sector's research agenda may need to be directed and what can be gained from this.

BRANZ's current work to support ongoing development of codes and standards contributes heavily to sector efficiency by ensuring these are well-reasoned, not unduly onerous, and as easy as possible to apply.

2 From July 31 2008

Disclaimer

Every effort has been made to ensure accuracy in reporting the views expressed in the Short Form Research Agenda workshop and in drawing appropriate conclusions.

However, please note the views expressed in this report are ultimately those of the author and cannot be taken to represent the views of contributors and experts participating in the workshop.

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