Australian Institute of Architects

BIM AND BEYOND

**DESIGN TECHNOLOGY
IN ARCHITECTURE**
2021 REPORT

Sponsored by NBS Australia

NBS

NBS

Connected Construction Information

NBS is an integrated global platform for everyone involved in the design, supply and construction of the built environment.

NBS Chorus

NBS Source

Collaborative cloud based specifications for architects, engineers, and specifiers.

The construction product information you need, at your fingertips.

- ✓ Write specs smarter and faster
- ✓ Collaborate on specs in real-time
- ✓ Plug-ins for Revit, ArchiCAD, or Vectorworks

- ✓ Browse products using intuitive search
- ✓ Select and compare products using structured properties
- ✓ Specify products directly into NBS Chorus

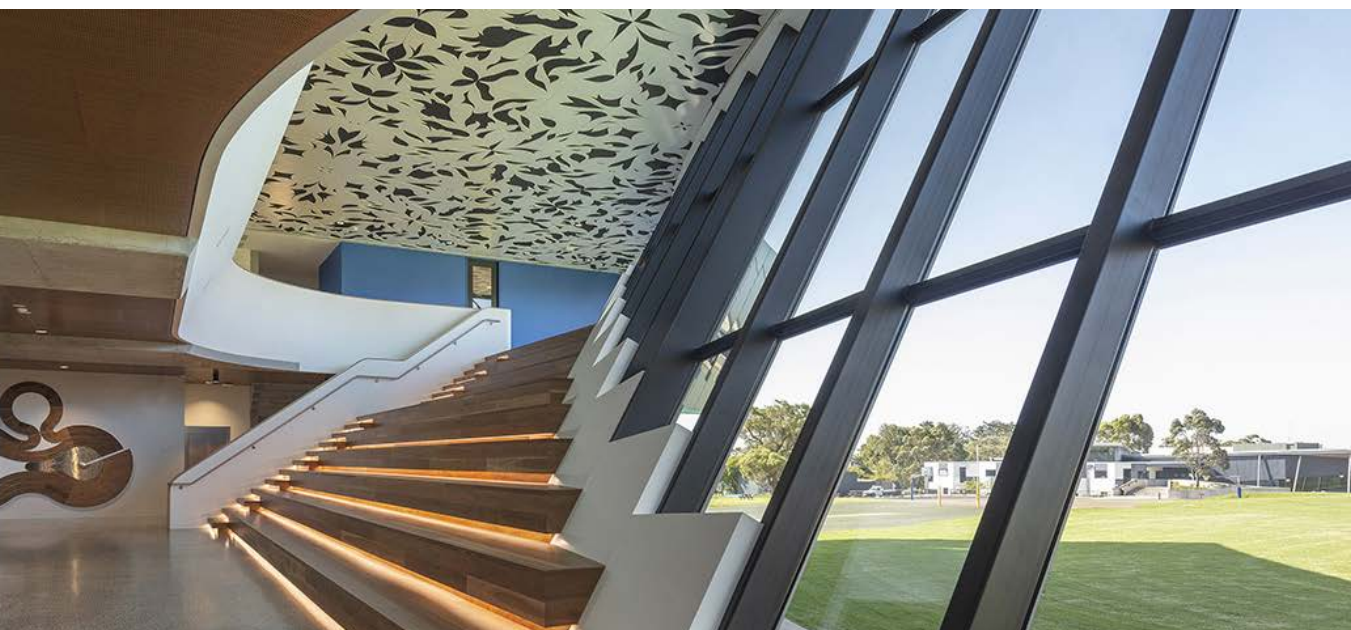**Content sets available:**

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The Swift Science Technology Centre
–
McBride Charles Ryan
–
Photography: John Gollings Photography

Cover Image
'The Crest' at The Crest Apartments
–
Type: Integrated Public Artwork
Artist: Rick Vermey
Design Assist: Intensive Fields Lab (if/LAB)
Architect: Woods Bagot
Client: Norup + Wilson
–
Photography: Daniel Giuffre

FOREWORD

Despite BIM adoption being mature in Australia, a range of opportunities exist to increase awareness and uptake as highlighted in this new report, produced in partnership with NBS.

Central to the Institute's mission is to deliver added value to members, BIM and Beyond: Design in Architecture does this by aiming to help future-proof our members' architectural practices by providing them with data to inform investment decisions as architecture moves further into the digital realm.

The data gathered in this report clearly points to a future where design technology and automation will be an even bigger part of practice.

The report also highlights the potential for missed opportunities when client assumptions go untested and demonstrates where practices are testing and exploring new commercial opportunity.

Staying at the forefront of the digital frontier is essential to remaining ahead of the productivity curve. I commend this report to you as a valuable tool to assist you in doing just that.

Tony Gianonne

President
Australian Institute of Architects

We are delighted to publish this report in partnership with the Australian Institute of Architects.

BIM communities in Australia continue to forge ahead. We are seeing BIM adoption maturing with consultants, contractors and clients continuing to adopt and promote new digital ways of working. At the same time, organisations not actively using BIM risk falling behind in terms of productivity, education and opportunity.

Internationally, BIM uptake has been accelerated by government mandates, while in Australia we have seen a more fragmented approach from various levels of government in different jurisdictions. Despite this, the findings in the report give us confidence that BIM uptake will continue to mature rapidly.

Opportunities and challenges surrounding BIM adoption are highlighted in the report. Those who have adopted BIM have not necessarily found it easy, but the rewards are plain to see.

In discussions with our clients, we see a strong desire to embrace emerging design technologies within their practices, however some still lack the internal resources to properly implement BIM. Products like NBS Chorus can help upskill staff. Design students are also being taught these technologies at university and these skills will become even more in-demand.

We also see a need to reach outside of design and construction to educate asset owners and clients about the potential return on investment and benefits of BIM.

No matter where you are on your BIM journey, we trust that you will find this report insightful and valuable.

Lincoln Easton

Managing Director
NBS Australia

NBS

ONE INTRODUCTION

The Australian Institute of Architects and partner NBS are proud to share the findings of our 2021 research study, which examines the usage of design technology in Australian architecture.

The intention of this survey is to provide meaningful information to support leaders of architectural practices in making decisions around skills, investment, services and client education.

We know that the concept of Building Information Modelling (BIM) has ignited the interest and enthusiasm of architects, contractors and clients as a means to collaborate across a range of disciplines to streamline design, construction, asset maintenance, operations and management.

With BIM continuing to evolve at a great rate, our research aimed to understand: how far architectural practices have come in adopting both BIM and broader design technologies into their practices; clients' willingness to invest in its use; and where challenges and opportunities for further progress might exist.

This survey was concurrently conducted with a shorter complementary survey distributed to senior managers and technical specialists drawn from manufacturing industries to identify potential gaps in knowledge that may be bridged by further understanding and education to improve product information supplied to architectural firms.

We have aimed to share findings that will ignite interest, education and action by architectural firms and ultimately flow through to clients and manufacturers.

Project: 'Glenarm Square'
Architects: Plus Architecture

Level displacement and Section

Flat Perspective
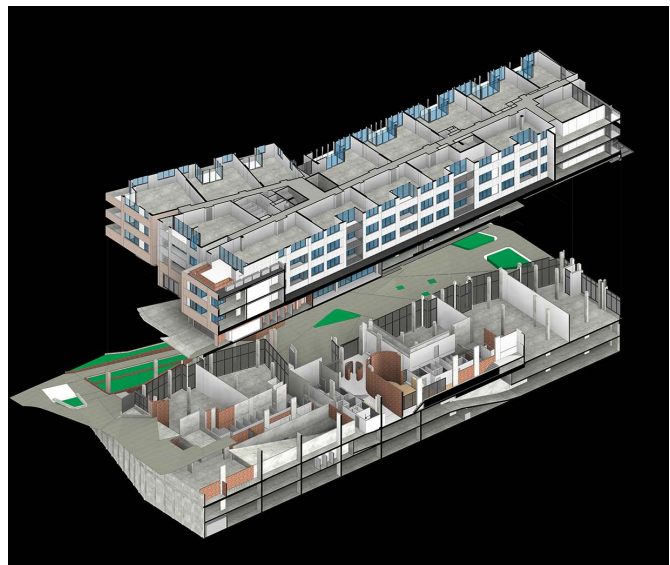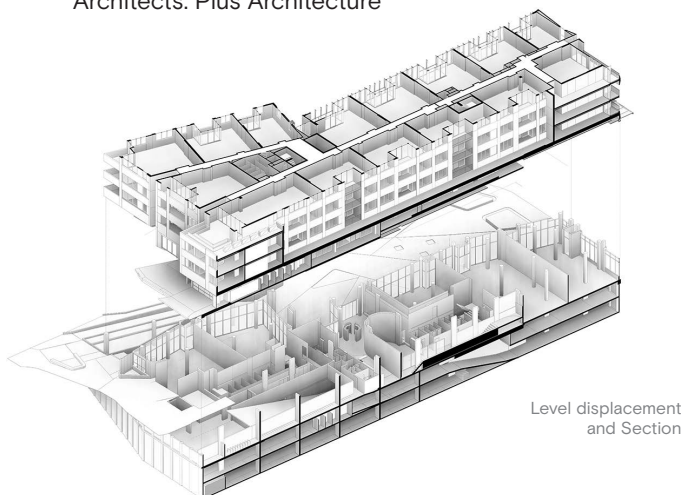
TWO METHODOLOGY

In formulating the questions and themes, we undertook four forms of consultation as outlined below.

The Institute undertook data collection through the establishment of a targeted list of 400+ stakeholders and a call for responses in the Institute's member e-news.

These stakeholders each received personalised calls to ensure they understood the request and the survey. In addition NBS supported the data collection by distributing the survey to their clients.

Institute Key Personnel Consultation	Members of the Institute's National and Western Australian Design Technology Committees were consulted during two independent feedback sessions whereby a presentation was given to committee members with the initial basis of a survey. We asked committee members to critique the initial survey presented and add, edit or subtract content.
	Member-facing Institute staff have deep domain knowledge. We provided key staff with an opportunity to shape the content of the survey.
Member Survey	We distributed a survey to 12,000 Institute members putting an open-ended question to them, which asked what information would support decision-making in regards to the investment in design technology within their business. We distributed the survey via the Institute's member e-news and through the online member-only Community portal. The purpose of the capture of information from this method of consultation was to ensure all members were provided with the opportunity to influence the report's content.
NBS Research	We examined the questionnaires utilised by prior NBS UK research studies to determine suitability of content for inclusion. In addition the NBS Research team provided feedback on content.
Targeted Respondent Survey	We identified a targeted list of 400 hand-selected design technology experts and surveyed them to confirm what information would support decision-making in regards to the investment in design technology within their business.

THREE KEY FINDINGS

→ Design Technology has a seat at the decision-making table with representation in the leadership team of 64% of responding practices.

→ Over half of responding practices are purchasing and developing design automation tools.

→ BIM adoption in Australia is mature and organisations not actively using BIM are behind the productivity frontier.

→ While BIM adoption in Australia is mature, survey results show that further education and exploratory time is needed for users to truly differentiate the technology with the process, as a third of respondents held the assumption that by using Autodesk® Revit®, they were using "BIM".

→ 77% of respondents believe that BIM improves coordination of construction documentation.

→ 82% believe BIM will be used on the majority of projects in 5 years' time with 55% of these respondents believing it will be used on all projects (in 5 years' time).

→ Over 53% of respondents agree that those procuring buildings or other assets for Public and Private clients don't understand the return on investment and benefits of BIM.

→ While only 7% of respondents believe clients would like education on BIM, this assumption is grossly incorrect. When asked directly, close to half of clients expressed their eagerness to learn more.

→ 30% of respondents noted that they charge no additional cost for clients using their BIM capabilities.

→ Over half of those engaged in international projects indicated they believed the demand for architects to use BIM tools was higher than their experience of demand in the domestic Australian market.

→ Architects must rise to the challenge and continue to educate their clients on the benefits of BIM.

→ 9% of respondents are currently selling services that use their AI capability. 30% of respondents are not yet selling, but seeking fees in this area in the near or immediate future.

→ 6% of respondents are selling services which use blockchain.

→ Architectural firms should embrace the potential of emerging technologies by deeply entwining it into their business models.
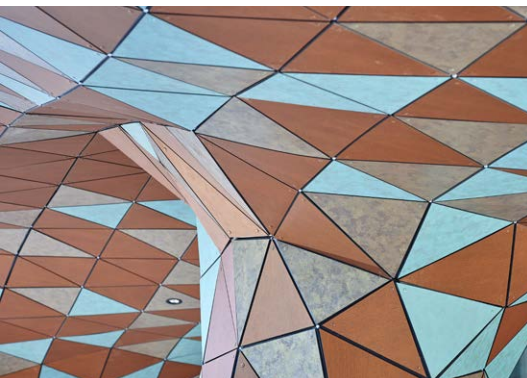
'Anemoi' at LIV Apartments
–
Type: Integrated Public Artwork
Artists: Daniel Giuffre (if/LAB) and Rick Vermey
Architects: Hassell
Client: Defence Housing Australia (DHA)
–
Photography: Frances Andrijich

'Undulation and Flow' at The Precinct Apartments
–
Type: Integrated Public Artwork
Artist: Rick Vermey
Design Assist: Intensive Fields Lab (if/LAB)
Architect: Woods Bagot
Client: Norup + Wilson
–
Photography: Daniel Giuffre

FOUR GETTING TO KNOW THE SURVEY RESPONDENTS

The information in this document has been provided by a cohort of senior decision makers and influencers in Australian architectural practice. Respondents represented the decisions and reflections of practices that collectively employed approximately 8,000 staff.

Across a two-week period, we received 125 survey responses drawn from a range of architects and design technology specialists from practices around Australia. This far-reaching distribution contributed to the depth of data and variety of responses received.

The survey aimed to engage senior architects in positions of influence.

Our respondents represent a cohort of very engaged professionals in design technology. 88% of respondents confirmed their titles as Principals/Directors or Senior Leaders with responsibility for making decisions around the future directions of their business and/or implementing the direction as set out by Principals/Directors. Respondents represented the decisions of practices that collectively employed approximately 8,000 staff.

- 82% of respondents stated that they were active and proficient users of design technologies.
- 50% of respondents were drawn from a single studio firm, while 49% were drawn from multi-studio practices. Of these, 19% worked within firms which had more than 6 studios.
- 34% of respondents had 21+ years of experience practicing as an architect.

58% of responses were from practices with 25 people or less, 21% from practices with 26-100 people, and finally, 21% of responses from practices with greater than 100 people.

South Hedland Town Square Performance Shell
–
Design Team: UDLA with Advanced Timber Concepts (ATC)
Computational Designer (Gridshell): Tristan Morgan
Client: Town of Port Headland
–
Photography: Patrick Beale

Respondent practice number of employees

501+ **13.6**%
251–500 **1.6**%
101–250 **6.4**%
51–100 **9.6**%
26–50 **10.4**%

<5 **33.6**%
6–25 **24.8**%
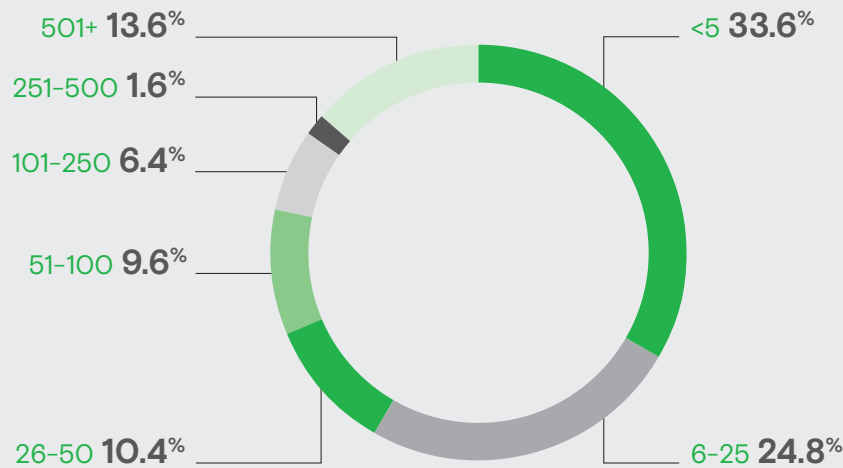
Respondent location

Victoria, New South Wales and Queensland contributed the most responses (77%), which is directly proportional to the Institute's membership base (74%). Responses to the survey were also received from South Australia, Western Australia, the Northern Territory and Tasmania, albeit at proportionately reduced levels.

TAS **4.0**%
NT **0.8**%
WA **9.6**%
SA **6.4**%
QLD **16.8**%

VIC **24.8**%
NSW **37.6**%
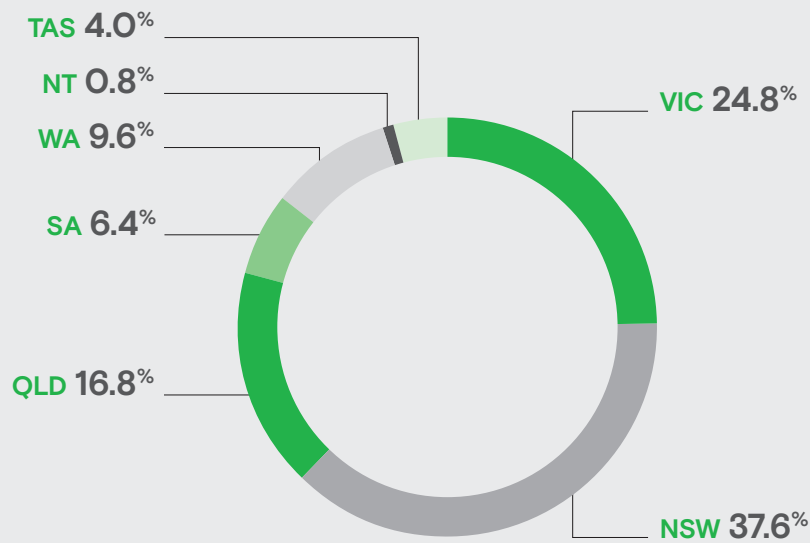
Number of studios of respondent's practice

1	51.20%	
2	16.80%	
3	6.40%	
4	4.00%	
5	2.40%	
6+	19.20%	

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Respondent confidence in skills and knowledge of BIM

Somewhat confident
14.29%

Extremely confident
35.71%

Quite confident
50.00%

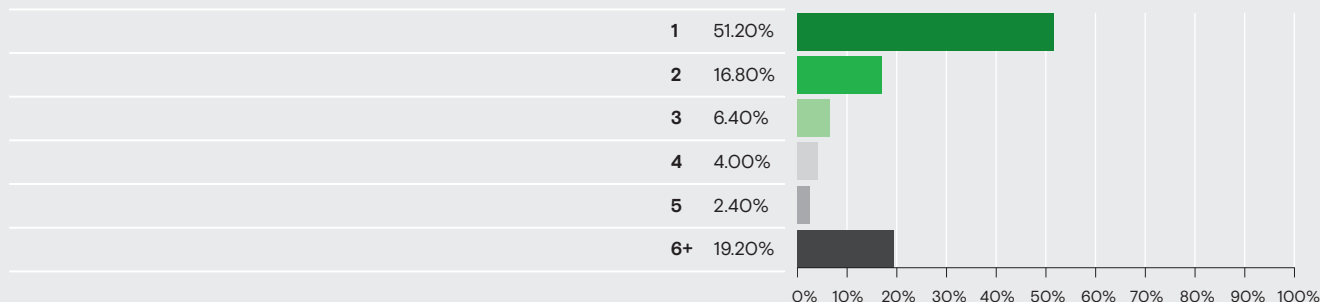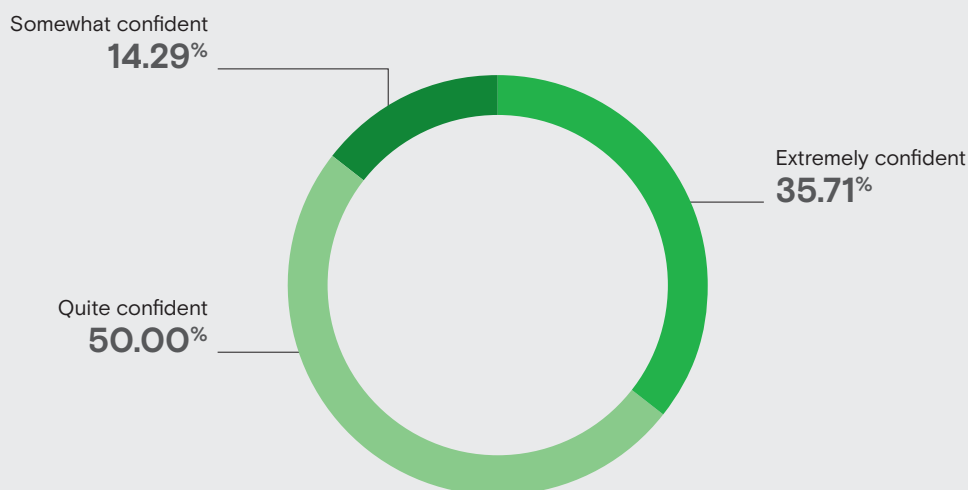NOTE: Survey answers which reflected a lack of confidence received zero responses

The content in this document may be new to some and known to others. BIM and Beyond – Design Technology in Architecture, provides strong foundational knowledge of the here and now, hinting at the opportunities with emerging technologies. Practice Leaders reading this content will need to consider how the content applies to their sectors and client base. Across multiple reports prepared by the Institute the themes of client education and ROI repeatedly arise. There is an imperative for Architects to close the loop on these matters to strengthen their influence across the supply chain. We can see that role of an educated client is playing out well in the Australian education sector with market trends and survey results showing this related to design for manufacture and assembly, so there is much to be gained from this investment, both by the profession and industry as a whole through all representative bodies but also, through the efforts of individual practices. In future work we hope to support this and take a deeper dive into the new service areas supported by emerging design technologies.

Alexia Lidas
General Manager Strategic Innovation and Enterprise
Australian Institute of Architects

Understanding the general profile of respondents paints a picture which can act as a background to understand their perspectives. Critical to accurately completing this assessment was getting a picture of how participants defined BIM.

Over 90% of respondents agreed on the definition that BIM "is the planning and application of a 3-dimensional data-rich virtual modelling system that allows designers, contractors and clients to interact with their projects to extract and use the information to streamline their design, construction, asset maintenance, operations and management." Moreover, there was overwhelming consensus (84.7%) that BIM is about not just the technology, but also the process.
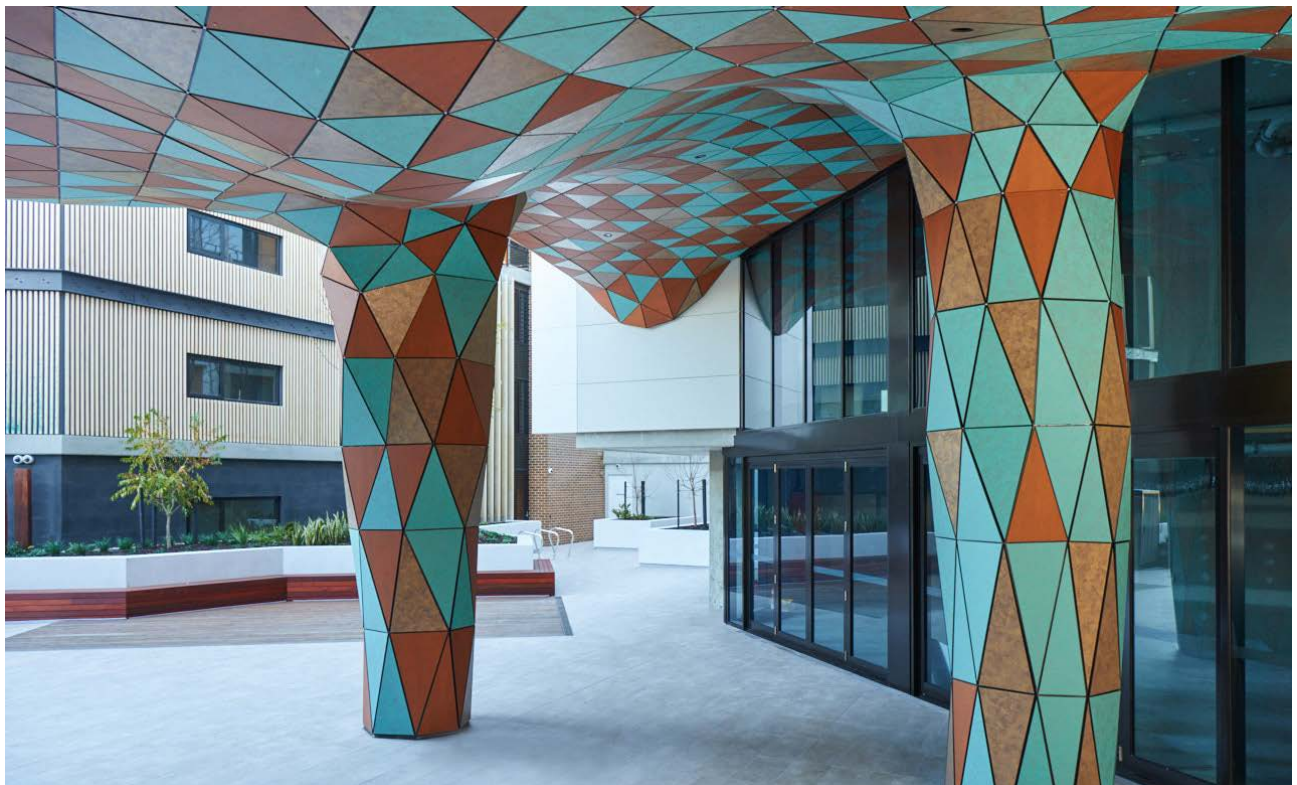
Yet despite this, a third of respondents (31%) still held the assumption that by using Autodesk® Revit®, they were using BIM. When a brand has a strong position in the market, users will directly connect the brand name to the process output, when in fact these two items are different. This demonstrates two things:

- The ongoing need for design technology leaders to educate their colleagues on the difference between individual design authoring software, such as Revit, and the broader BIM process.

- A limitation of user exploration. Exploration time establishes broader connections with the process vs the technology.

As one respondent says,

"

(WE VIEW) BIM AS A HOLISTIC APPROACH TO DESIGN, WITH DIVERSE SKILLS AND PLATFORMS, RATHER THAN SIMPLY REVIT AND THE ASSOCIATED TECHNICIANS.

"

'Anemoi' at LIV Apartments
–
Type: Integrated Public Artwork
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FIVE BIM IN MARKET

5.1 USE AND UPTAKE

Gone are the days where professionals with BIM skills were unable to utilise them. Of those surveyed there is a widespread use of BIM within their work and the work they see across their practice. Survey results also show that the use of BIM is anticipated to grow.
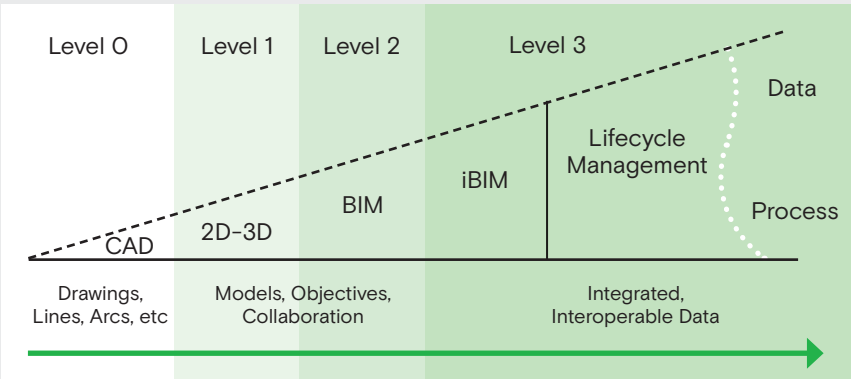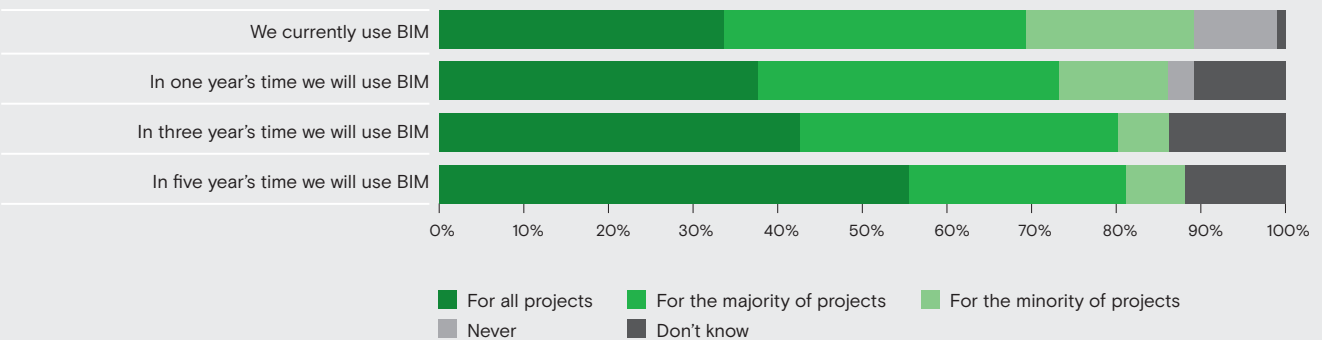
When we examine the current use of BIM, 70% of respondents reported using it for the majority of their projects. 20% claimed to use BIM for a minority of projects. In contrast, only 9% of respondents claimed not to be using BIM at all, with the remaining 1% unsure. Respondents provided data on the anticipated increase of BIM use in the future.

The most significant finding in this data is the growth trajectory for use of BIM on all projects over the next five years. While only 33% of respondents are currently

82% believe BIM will be used on the majority of projects in 5 years' time with 55% of these respondents believing it will be used on all projects (in 5 years' time).

using BIM for all projects now, over 55% of respondents believe that BIM will be used on all projects in just 5 years' time. Interestingly, while respondents report that over half of clients don't see the value in BIM, 53% of respondents forecast that clients and contractors will increasingly insist on architects using BIM. This indicates that respondents are seeing changes in attitudes and awareness from clients.

Use of BIM on projects

Legend:
- For all projects
- For the majority of projects
- For the minority of projects
- Never
- Don't know

Bars: We currently use BIM; In one year's time we will use BIM; In three year's time we will use BIM; In five year's time we will use BIM

Level 0 — CAD — Drawings, Lines, Arcs, etc
Level 1 — 2D–3D
Level 2 — BIM — Models, Objectives, Collaboration
Level 3 — iBIM — Lifecycle Management — Data — Process — Integrated, Interoperable Data

Taken as a whole, the adoption of BIM follows the 'Technology Adoption Life Cycle' as popularised by Everett Rogers back in 1962[1]. According to Rogers' classic bell curve, customers can be segmented into five groups, with each segment representing a unique psychographic profile. For example, 'Innovators' are the first group (2.5%) of people that are likely to invest in new technology since they pursue new technology aggressively. 'Early adopters' (13.5%) are not technologists. Instead, they are people who find it easy to imagine and appreciate the benefits of new technology. The 'early majority' (34%) are driven by a strong sense of practicality and are often content to wait and see how other people are making out before they buy into it themselves. The 'late majority' (34%) wait until something has become an established standard. Finally, there are the 'Laggards' (16%) who simply don't want anything to do with new technology, for a variety of reasons, some personal and some economic.

In any case, it is evident that the adoption of BIM in Australia is mature, and in the framework of technology adoption life cycle, well into the 'late majority'.

We are, therefore, at a point in time that if an individual and or a practice is not actively using BIM, they are behind the productivity frontier. Organisations and individuals that embrace the do-nothing 'Laggard' scenario will likely experience a non-linear decline in performance, which is exacerbated over time.

5.2 BENEFITS

A significant 83% of respondents noted that BIM adoption has brought about changes to existing workflows, practices, or procedures. Despite this disruption, Practices have overcome the changes and a strong 51% reported that BIM has increased their profitability and 61% agree that the use of BIM has increased delivery speed.

60%
of respondents believe that using BIM results in operation and maintenance savings.
The most significant source of improvement was cited as improved coordination of construction documentation 77%.

Interestingly, 9% of respondents claimed that the introduction of BIM had an adverse impact on their organisation's profitability or delivery speed, however these respondents also cited having no established contractual framework for working with BIM and a lack of in-house expertise as barriers to BIM adoption. This supports commonly used arguments that the process must be holistically designed and managed for users to gain the real benefits.

Everett Rogers's classic bell curve of five distinct customer segments (1962) – innovators, early adopters, early majority, late majority, and laggards.

Innov-ations (2.5%) | Early Adopters (13.5%) | Early Majority (34%) | Late Majority (34%) | Laggards (16%)
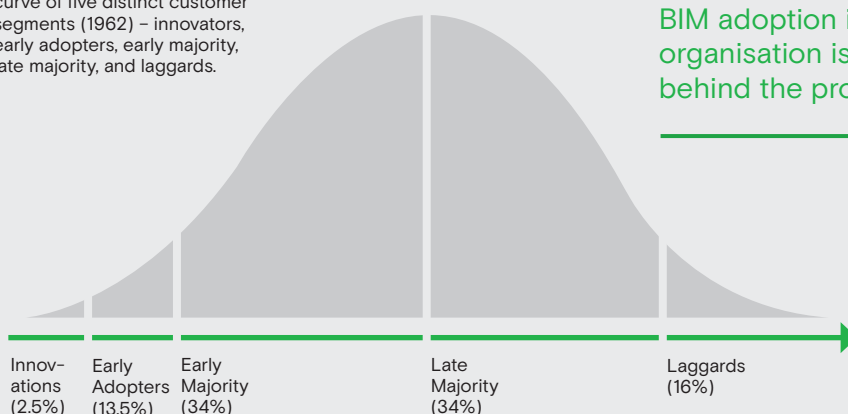
BIM adoption in Australia is mature. If your organisation is not actively using BIM it's behind the productivity frontier.

1. Rogers, E. (1962). Diffusion of Innovations. Free Press of Glencoe, New York.

5.3 CLIENT PERSPECTIVES

This survey draws data from the Australian architectural profession providing their observation of client perspectives across BIM & design technology more broadly. Where possible, a contrast has been provided with perspectives on the same topics taken from the 2021, Stronger Insights for Stronger Practices, Client Feedback Report – sponsored by Lysaght.

57% of respondents believe that clients are not willing to invest in BIM. Responding 53% for private sector clients and 56% for public sector clients, respondents also don't believe clients understand the return on investment and benefits of BIM.

Respondents provided commentary in response to clients' willingness to invest in BIM. These comments articulate that a client's willingness to invest in BIM is highly dependent on the sector in addition to the project and client size, with public sector clients most likely to benefit from procuring BIM.

Informed clients are generally the best clients as they know what they would like, why it is of value to them and how to procure it. However, it can be unclear where the burden of investment should lie to provide clients with education.

45% of respondents' practices invest time in educating clients about design technology. This statistic was surprising given that only 7% of respondents believe clients would like education on BIM, and a further 9% believe clients are not willing to listen to the benefits of BIM.

While only **7%** of respondents believe clients would like education on BIM, when asked directly, close to half of clients are eager to learn more.

Prior research recently conducted by the Institute says otherwise. Within Stronger Insights for Stronger Practices, sponsored by Lysaght, the Institute uncovered that 41% of clients would like further education on technologies within design and construction.

An opportunity exists for architectural practices to invest in and deliver educational material to clients.

Are clients willing to invest in BIM?

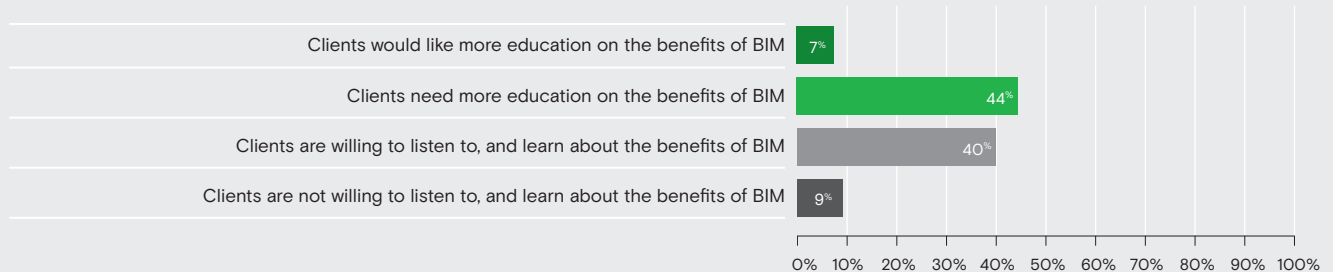|	
Yes	43%
No	57%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Many comment that international clients operating in Australia have an increased knowledge and willingness to invest in BIM, do you agree?

Yes	49%
No	51%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Do you believe the following statements apply?

Statement	Percentage
Clients would like more education on the benefits of BIM	7%
Clients need more education on the benefits of BIM	44%
Clients are willing to listen to, and learn about the benefits of BIM	40%
Clients are not willing to listen to, and learn about the benefits of BIM	9%

Does your firm spend time educating clients on design technologies, which will advance architectural output?

	Percentage
Yes	45%
No	55%

However when asked directly clients say...

Has your architectural practice provided you with education on the benefits of BIM?

	Percentage
Yes	33%
No	44%
Unsure	23%

Select all areas about design and construction you would like to learn about

	Percentage
Modern methods of construction	46%
Technology	41%
Sustainability	36%
Other (please specify)	7%
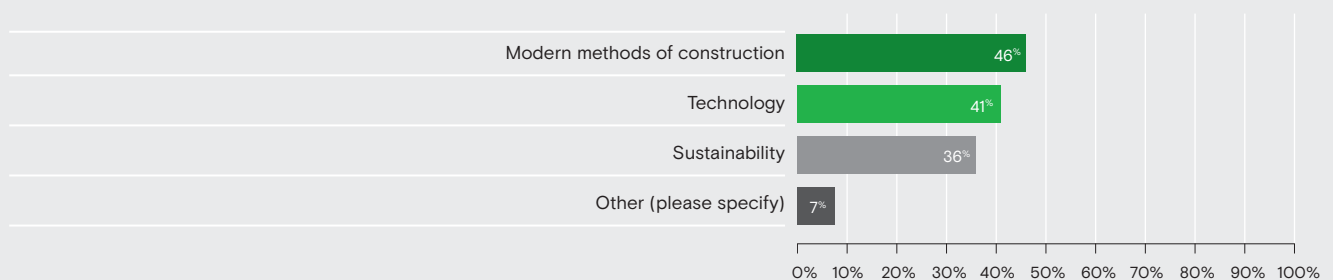
Source: 2021, Stronger Insights for Stronger Practices, Client Feedback report sponsored by Lysaght

5.4 SALEABILITY

68% of respondents reported that clients proactively ask about their BIM capability, however despite this, many found it difficult to 'sell' BIM. These results applied to all organisations, regardless of their size.

As we have already established, over half of respondents do not believe clients understand the return on investment and benefits of BIM. Given this, it's no surprise that selling BIM is difficult for architectural practices.

Interestingly, 51% of respondents reported increased profitability due to BIM and 51% of respondents reported productivity increases due to BIM. Indeed, this is supported by 30% of respondents who noted no additional cost for clients using their BIM capabilities. One respondent noted, "it is a part of how we operate daily."

30%
of respondents noted that they charge no additional cost for clients using their BIM capabilities.

Another says: *"It is generally included in our fee. [However,] as more architects develop skills in BIM, informed clients come to expect this service but are not generally willing to pay for this large investment by architects by way of additional fees. BIM does provide early adopter architects with increased efficiency and hence an increased profitability, however as the industry equalises, we as a discipline have invested in providing clients with a better coordinated and information resource, without the ability to charge higher fees."*

A further respondent states: *"We substantiate the cost by means of faster delivery"*.

With this data and commentary in mind, it would seem that BIM is being absorbed by many practices as a cost of doing business and that the savings in staffing gained through increased productivity are providing adequate return on investment for some practices that are not recouping the cost of BIM through client fees.

'Undulation and Flow' at The Precinct Apartments
–
Type: Integrated Public Artwork
Artist: Rick Vermey
Design Assist: Intensive Fields Lab (if/LAB)
Architect: Woods Bagot
Client: Norup + Wilson
–
Photography: Daniel Giuffre

However, as evidenced in section 5.3 of this report, respondents believe clients are willing to invest in BIM when they clearly understand the value of these services through a return on investment. Many of the respondents provided examples of the sectors in which these clients could be found, with the common thread being that these clients were designing, building and operating the assets.

When asked to select the most significant barriers to BIM, a lack of client interest was nominated by only 26% of respondents. Assessing all of the data provided within this survey, clients are asking about BIM, however many do not understand the benefits of BIM. The best results are seen with clients who own and operate their assets (likely for a multitude of reasons) however the most-cited reason is a clear return on investment.

Therefore, it would seem that the key to increasing the saleability of BIM is for the profession to provide clients with case studies which can be understood and appreciated by the asset operator with return on investment data such as cost savings, decreased energy use, increased user experience etc.

42%

of survey respondents believe that adopting BIM has made it easier for them to work internationally.

When we examine the saleability of BIM beyond Australian projects, of those engaged in international projects, 61% indicated they believed the demand for architects to use BIM was higher than their experience in the domestic Australian market. 43% of those who had worked on an international project (in the last three years) indicated that BIM adoption had enhanced their opportunities to win international work.

Approximately one-third of the commentary provided by respondents highlighted that the UK's BIM mandate stood out as one of the reasons for the increase in demand, however comments gave a nod to a general increase in knowledge leading to demand.

"

IT VARIES FROM COUNTRY TO COUNTRY. DEPENDING ON REGULATION, EG. THE UK WHICH HAS REGULATED BIM LEVEL 2.

INTERNATIONAL CLIENTS STRONGLY RELY ON ARCHITECTS TO USE BIM TO KEEP THEIR PROJECTS IN CHECK FOR PROGRESS DURING THE DESIGN AND DOCUMENTATION PROCESS.

"

Do you work in international markets?

YES 42%

NO 58%
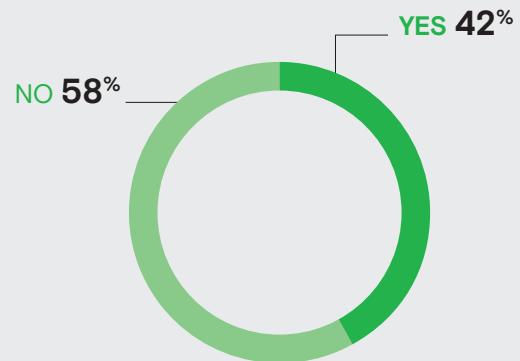
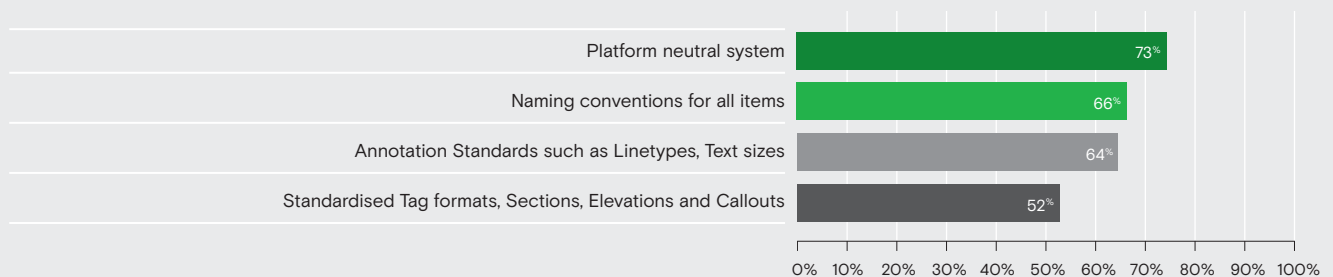**Is the demand for BIM higher in international markets?**

YES 61%

NO 39%
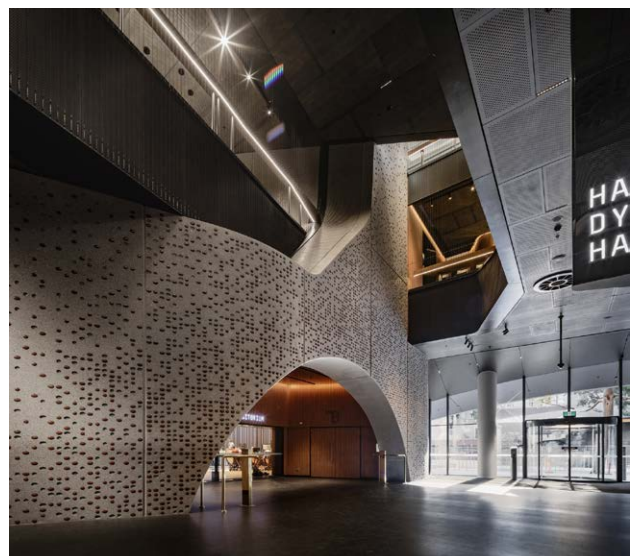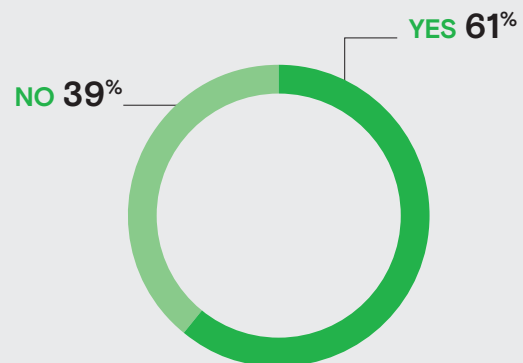
Educational
–
IPSC JWA
–
Photography:
Trevor Mein

5.5 MARKET EXPECTATIONS OF MANUFACTURERS

Do you believe the usage of BIM could be enhanced for architectural firms, if manufacturers used globally accepted standards/recognised certification to demonstrate that their content is standardised?

Yes	96%
No	8%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

What standards do you believe this should this include (select all that apply)?

Platform neutral system	73%
Naming conventions for all items	66%
Annotation Standards such as Linetypes, Text sizes	64%
Standardised Tag formats, Sections, Elevations and Callouts	52%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Would it be beneficial to include different levels of details in supplier models?

Yes	69%
No	31%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Specification has progressed from traditional paper-based systems, to desktop, to fully online. Innovative architects are future-proofing their practices by switching to digital specification using cloud-based platforms, recognising the need for better collaboration, improving coordination of construction documentation with BIM – and all the business benefits this brings. The industry agrees with the principle that digital construction is good, so the challenges are in the detail. What to do, and how? There are always differing views about implementing new technologies and change of any kind. It is wise to evaluate the likely value of making a change before doing so, especially if that change or technology requires significant investment. The findings in BIM and Beyond – Design Technology in Architecture, indicate that the industry is headed in the right direction by embracing digital, that it is having a positive effect, and that digital ways of working and better information management are helping us to create a better and more sustainable built environment.

Eva Dixon
Sales & Marketing Director
NBS Australia

ARTICLE

The Value of BIM

by Ian Briggs

Director, Plus Architecture, Chair AIA National Design Technology Committee

For as long as architects have existed, clear and accurate communication has been one of their primary goals. The success or failure of any great idea rests on the ability of the designer to effectively articulate the intent to the team responsible for building the vision.

The body of information required to deliver an output (i.e. a building) has been one that is shared between designer and engineers, trades and other associated building practitioners. Today, that sharing has reached a new level of interoperability and dynamism through the advent of Building Information Modeling, or BIM. Designers, suppliers, clients and builders can work collaboratively to assemble a virtual building before a sod is turned. All manner of coordination problems can quickly be identified well before they appear on site. This is the fantastic benefit of an accurate BIM model.

However, a true BIM model is more than just a 3D model of a design informing a builder what to build. It is a database of information that represents every aspect of the building. Information about what the building is made of, how it is serviced, where items like lightbulbs and ovens are sourced from and what their warranties are. This database can provide end users with a virtual twin of their property, giving them real time awareness of how their building is operating. The information contained in a BIM model captures detail like never before and it represents a valuable commodity for many end users.

Owners of hospitals, hotels, industrial plants along with any other building typologies that are owned by a single entity have been the leaders in this respect. Through the application of these data rich BIM models, building managers can see if there is a functional problem with their building, easily diagnose issues in real time and order specific replacement parts almost as soon as the issues are identified. But, as so often the case in Australia, it is the residential property market that will likely supercharge the implementation and exploitation of this building data and bring it into our daily lives.

In today's surging property market, fewer people than ever before can afford their own home. In response, there is a growing trend to follow European and North American models such as Build to Rent (BTR) and the provision of long-term rental properties. In both cases, the building is owned by a single entity and its management see huge advantages in a virtual twin of their building. The building will alert maintenance teams of any mechanical, electrical, or other issues that might occur. This is in the interest of building owners who want to maintain the ongoing viability and quality of their investment.

However, this database of information cannot magically appear. It is an amalgamation of all the decisions made by the team assembling the BIM model. As previously stated, it is also a database of all the constituent parts that make the whole, not just a set of instructions of what to build. It represents an enormous investment in time to enter the information that clients are now starting to demand as the norm, and currently this work is being done at little to no additional fee.

The construction of a BIM model is primarily governed by its LOD (Level of Development). LODs range from 100 through to 500. Think of LOD 100 as traditional 2D drafting, using generic or symbolic representations that convey the conceptual model. LOD 200 would be sufficient for early design work in 3D as it only includes approximate specification of quantity, size and locations.

LOD 300 is a developed 3D model that incorporates basic manufacturers specifications, quantities, costing, engineering details and coordinated servicing and structure. LOD 400 is a proposed virtual twin of the documented building and finally LOD 500 is an 'As-built' model, a field-verified measured virtual twin of the final building, an exact clone of the building including all technical data on every component used to construct the building.

Depending on the level of detail (LOD) required, the additional work required at the beginning of many project typologies might be in the order of up to 20% to achieve a planning permit. This rapidly escalates throughout the life of the do project. The more service 'heavy' typologies like hospitals might require three times the amount of additional work to deliver LOD 300. The real challenge for the architectural community is when end users start to require LOD 400 and LOD 500 models. The only way to provide an LOD 500 model is to measure every part of the built project. This includes elements that are usually hidden behind plasterboard walls and ceilings like wiring, service ducts, and structure. Apart from the difficulty of representing this sort of information, the architect providing an LOD 500 model assumes a level of responsibility for the accuracy of such a model. For example, when a fire department requires an exact 3D model to assist in a future fire emergency and the model is not 100% accurate, is the architect liable? The LOD 500 virtual twin will need to be consistent to its real-life version. It will need to be a 'living model', able to be updated and changed whenever the real-world building is changed. Operating software for equipment (such as the building management systems) will also need the ability to be updated like the latest generation of motor cars or smart phones. This will require ongoing automatic communications from most hardware and software suppliers involved.

How does an architectural practice place an appropriate value to this? What is 'above and beyond' the normal service provided by an architect in providing a data rich LOD 400 or 500 model? New technologies that automate office tasks are highlighting a potential future.

Software is available now that automatically scans your incoming and outgoing email communications, determines which project it is relating to and files the communications and any attachments in the correct project database. Future architectural AI, detailed office databases and intelligent product libraries will shortcut much of the laborious work of achieving higher and higher LOD. Coupled with consultants and suppliers who will also need to achieve matching LOD, the process of building the virtual twin building is becoming a reality.

We believe the future of BIM has three great challenges. Firstly, the information infrastructure must be built in a coordinated manner. Manufacturers, suppliers, consultants, and builders must invest in information rich virtual objects and processes. These groups must be able to seamlessly integrate, communicate and update information on the fly throughout the design and construction phases through to the operational life of the building.

Secondly, manufacturers, suppliers, consultants, and architects assume a new level of responsibility and liability regarding the accuracy and potentially ongoing maintenance of the BIM model. As lead consultants, architects will be at the forefront of this.

Finally, when the end user of a building and its virtual twin gain so much value from a an LOD 400 or 500 BIM model, how does the consultant team fairly charge for the time and effort required to achieve this. How much is a BIM model worth? Evidently, the value it may bring is immense, but it can come with a commensurate cost and risk if not engaged wisely.

Ian Briggs

Director
Plus Architecture

SIX BIM ADOPTION BARRIERS
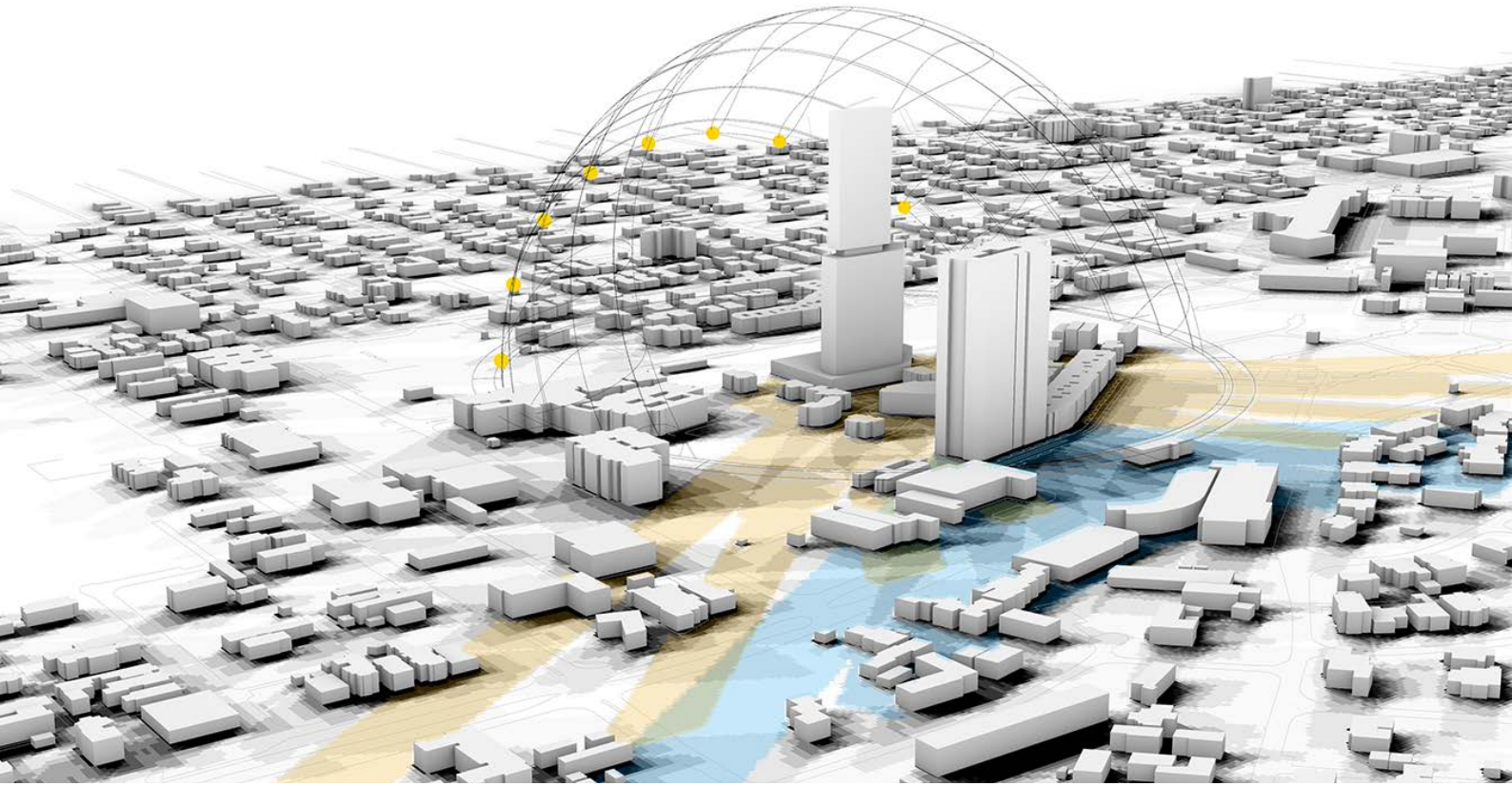
The requirements of expertise, cost, and education were top of mind for respondents as key barriers to BIM adoption. The top five most cited barriers were:

- Lack of in-house expertise 56%
- Cost of software 52%
- Lack of standardised protocols 50%
- No established contractual framework for working with BIM 46%
- Lack of training 45%

Note: respondents were provided with a list of approximately 20 barriers and asked to select all that applied to them.

A lack of in-house expertise and training continues to be a concern as the industry goes through significant transformation.

Despite this limitation, there was a strong desire to digitally upskill with the support of their employer. Cost of training and lack of training budget, were separately listed as barriers for respondents to select. Only 20% of respondents selected these options, meaning that what's in the market is not out of reach due to the cost or lack of budget to pay for these costs, rather– there's not enough of it.

> **THERE IS A SKILL SHORTAGE IN THE INDUSTRY AND IT'S DIFFICULT TO GET THE HIGH LEVELS OF TECHNICAL KNOWLEDGE. WE ALSO NEED CLIENTS TO INVEST BECAUSE THERE IS MORE TIME, SKILL AND EFFORT TO CREATE A LEGACY FOR THEM.**

It was evident that much more work around establishing a contractual framework when working with BIM is needed, with 47% believing that current contracts were not compatible with BIM. Since the introduction of the AIA's 2019 Client Architect Agreement (CAA2019), clause F4 makes an allowance for BIM use. Building contracts, on the other hand, such as the Australian Building Industry Contracts (ABIC), make no mention of BIM. While these contracts don't necessarily preclude BIM use, more could be done to encourage it. One way these contracts do not embrace BIM is that consultant contracts often reference the BIM Management Plan (sometimes also referred to as the BIM Execution Plan).

However, this document which defines how a project will be executed, monitored and controlled with regard to BIM, is often incomplete with 'to be complete' fields.

Over the past few years, there have been calls from industries to mandate BIM in Australia. The main precedent for this movement stems from the relatively successful UK Government mandate, which stated that all government projects worth £5m or more had to be delivered using 'BIM Level 2' by April 2016.[2]

In Australia, however, there has been no national mandate, with only selective state departments requiring its use. For example, since 1 July 2019, Queensland's Department of Transport and Main Roads has required all Queensland Government construction projects with a value of $50 million or more to use BIM from the early planning phase.[3]
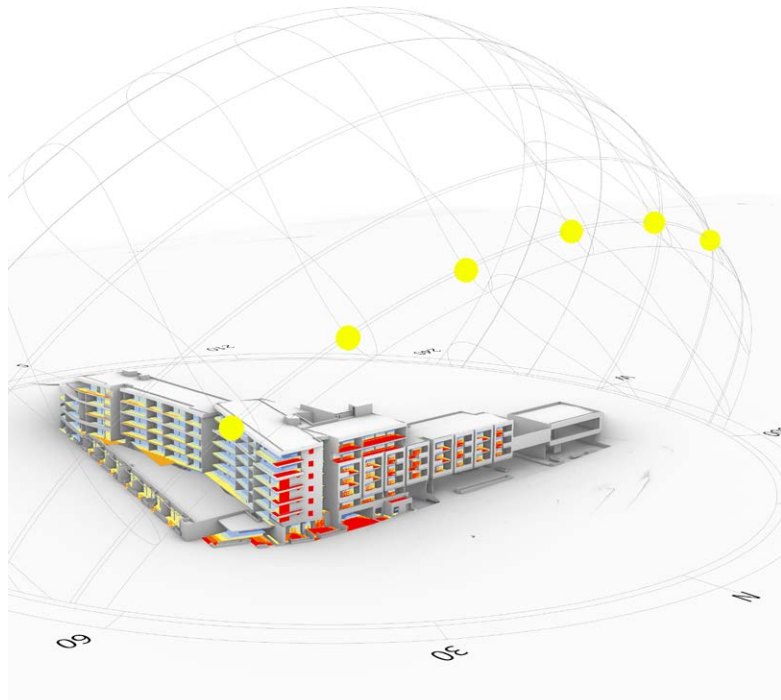
However, only 39% of respondents believed that a federal BIM mandate would help the market adopt BIM. As we begin to see digital transformation happening at a state level, such as the NSW Digital Twin[4] and Digital Twin Victoria,[5] we anticipate that more and more government agencies will mandate the use of BIM. Architects wanting to work with government agencies are well-advised to start preparing for this transition.

In terms of standards, 49% believed that a lack of standardised tools and protocols were a barrier to BIM adoption. However, opinion on whether a federal BIM standard would help the market adopt BIM was divided, with 51% of respondents believing it would. Institute members are advised to familiarise themselves with AS ISO 19650:2019, which addresses the organisation and digitisation of information about buildings and civil engineering works, including BIM.

The cost of software, at 52%, continues to be a hot topic and high on the list of barriers. Much of this concern we suspect can be attributed to software vendors phasing out perpetual licence in lieu of software-as-a-service (saas), also known as subscription software. This shift has placed a greater financial burden on practices. Of interest, however, is that this concern is shared across organisations, regardless of their size.

On a positive note, only 26% of respondents indicated that a lack of client demand was a barrier to using BIM. Furthering market education, at 57%, and client education, at 54%, were seen as the two key actions to help the market better adopt BIM.

Architects must rise to this challenge and continue to educate their clients on the benefits of BIM.

Architects must rise to this challenge and continue to educate their clients on the benefits of BIM.

"

IF THEY WERE MADE AWARE OF THE ONGOING BENEFITS.

ONLY IF THERE IS A RETURN VISIBLE TO THEM.

"

2. Refer also https://www.procore.com/jobsite/does-australia-need-a-bim-mandate/ and https://www.thenbs.com.au/resources/articles/current-bim-practices-2019
3. Queensland Government. (19 Feb 2021). Building Information Modelling (BIM).
4. https://nsw.digitaltwin.terria.io/
5. https://www.land.vic.gov.au/maps-and-spatial/projects-and-programs/digital-twin-victoria

ARTICLE

Design: From Object to Process

by Daniel Guiffre, Tristan Morgan and Andrei Smolik (L>R)

Intensive Fields Lab

The architectural profession is on the verge of major disruption. The possibility of 'live' digital design information that seamlessly plugs into the construction process could very well lead to significant reduction of time spent on site. This will require architects to begin shifting focus onto re-imagining workflows and embracing new procurement models, new methods for designing for assembly and whole-life processes to deliver better outcomes for clients. Fundamentally, this requires us to shift our idea of architecture as conceptualising objects to conceiving processes.

Design technology including BIM, in our view, should not simply be an extension of the initial design, but a rethinking of design in the context of new emerging digital technologies that have broader implications that extend beyond our industry and allows for a better use of resources, ability to create better environments to inhabit, management resource scarcity and addressing climate change.

Clients demand better buildings, within shorter lead times, at lower fees and design technology is providing us with the solutions to meet these demands. Architecture firms have begun investing in developing design technology tools in house by training their staff, hiring experts, and reorganising their production workflows in order to offer a competitive customer value proposition. Good design challenges standard project delivery practices whilst design technology offers new possibilities for pushing the boundaries of what is possible in design. Optimising networks that link various technologies and empowering designers to make informed decisions at every stage of the process is not just a nice thing to have - it boosts profit margins by cutting down time needed to manually go through a variety of processes that could easily be automated.

FROM DESIGNING AN OBJECT TO DESIGNING A PROCESS.

Our testbed for developing these technology-driven tools is primarily within the public art realm where the scale and complexity are compatible with extremely fast lead times and offer a myriad of opportunities for iteration and refinement. We mainly use Rhino+Grasshopper workflows that offer a very robust environment for developing parametric models that focus on process-centric workflows. Grasshopper (GH) is a visual scripting language, meaning you do not have to spend too much time learning to code and once some proficiency is achieved, lots of tasks within projects become open for automation even if the projects themselves are too complex for immediate "total parameterisation". GH also allows us to encapsulate the entirety of the methodology in an (often) singe algorithm that describes design, driven by constraints, and which extends all the way to shop drawings, bills of quantities, and direct file-to-fabrication outputs all of which automatically update with any changes to design inputs. In some way, it could be conceived as a long chain of smaller tasks that are linked together where changes to earlier stages propagate into later ones. When shifting to designing a process you no longer have to commit to traditional project phases and can more freely focus on iterating design that would otherwise be constrained by a specific sequence of steps.

... it boosts profit margins by cutting down time needed to manually go through a variety of processes that could easily be automated.

CUSTOM INHOUSE TOOLS FOR DESIGN

For Ravensthorpe Cultural Centre we developed a structural system that is driven by a member size and grid spacing inputs that allowed for quick iteration of possible layout scenarios. We took advantage of Rhino.Inside.Revit to connect our Grasshopper scripts with Revit to directly feed parametric information into architectural drawings and schedules. Together with Timberbuilt Australia, we are working on extending this into a more robust platform capable of modular automated fabrication and construction of customisable timber cabins as well building capabilities for environmental analysis and optimisation.

Oftentimes, architects become trapped by the tools they are using. Unable to move beyond a certain set of features offered in mass-produced software that puts limits on designers who are often unaware of things like application program interfaces (APIs), visual scripting, plug-ins and algorithms. which are all indispensable tools in automating and customising design processes and facilitating design to production workflows. Undoubtedly, these approaches require new skill sets and time investment but they are sowing seeds for future benefits in practices that will be better equipped to automated processes of the future.

Figure 1: Piara Waters Integrated Facade Artwork design and construction drawings all via grasshopper script.
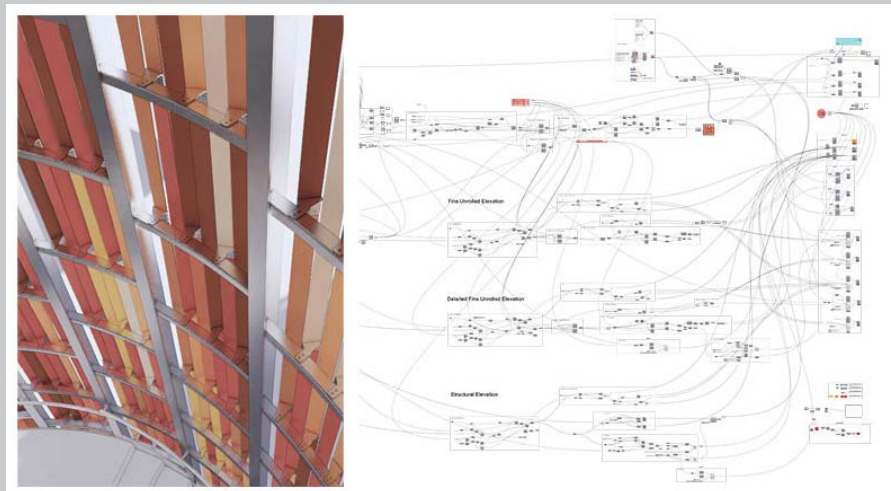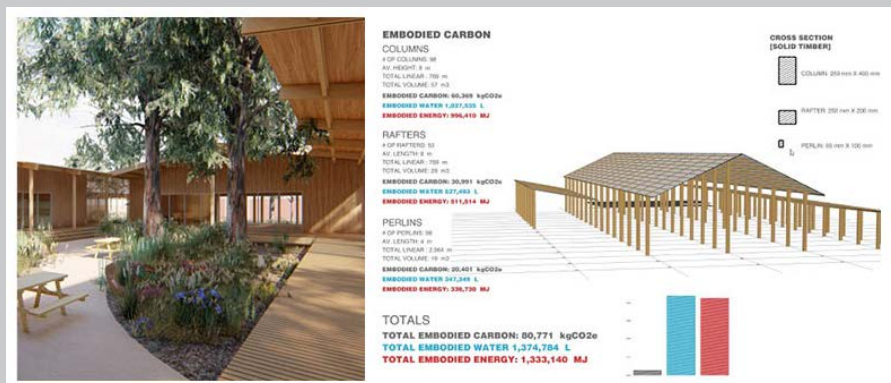

Figure 2: Ravensthorpe project was used as a testbed for new tools we are developing for design of timber structures.

SEVEN PRACTICE STRATEGY & FUTURE OPPORTUNITY

Design Technology and BIM have representation at a strategic level across most firms. This means that an individual is specifically either allocated to represent or has the knowledge and therefore considers the growth, client experience, skills, investment and strategy for design technology and BIM in their practice.

While 85% of respondents believed that digital tools should be adopted to "fast track unwanted grunt work" (Q.41), only half were actively buying or developing design automation tools to satisfy this

need (Q.25). As one would expect, the vast majority (75%) of respondents not buying or developing design automation tools were from small organisations with fewer than 25 people. We suspect that the disparity between larger practices and smaller organisations, can be attributed to economies of scale, at both a software and project typology level. Commercial viability in mind, this may be an opportunity for organisations to engage an external consultant to support the development of their digital technology strategy.
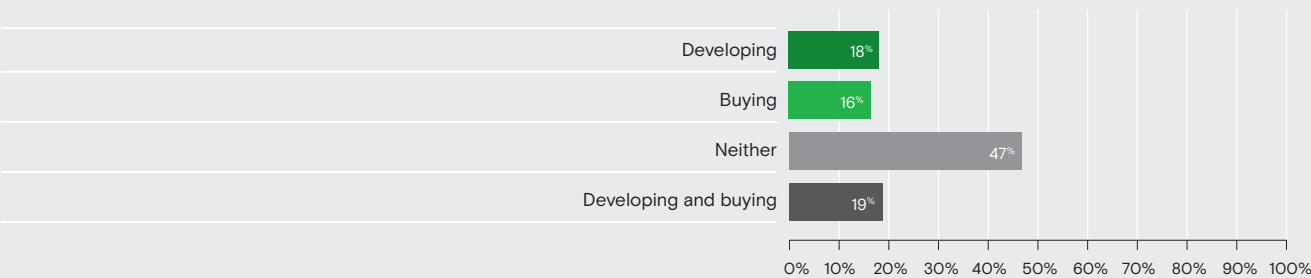
Does your practice leadership include an individual responsible for the strategy, growth and use of design technology?

Does your practice leadership include an individual responsible for the strategy, growth and use of BIM?

Is your practice developing, buying design automation tools?

‘The Crest’ at The Crest Apartments
–
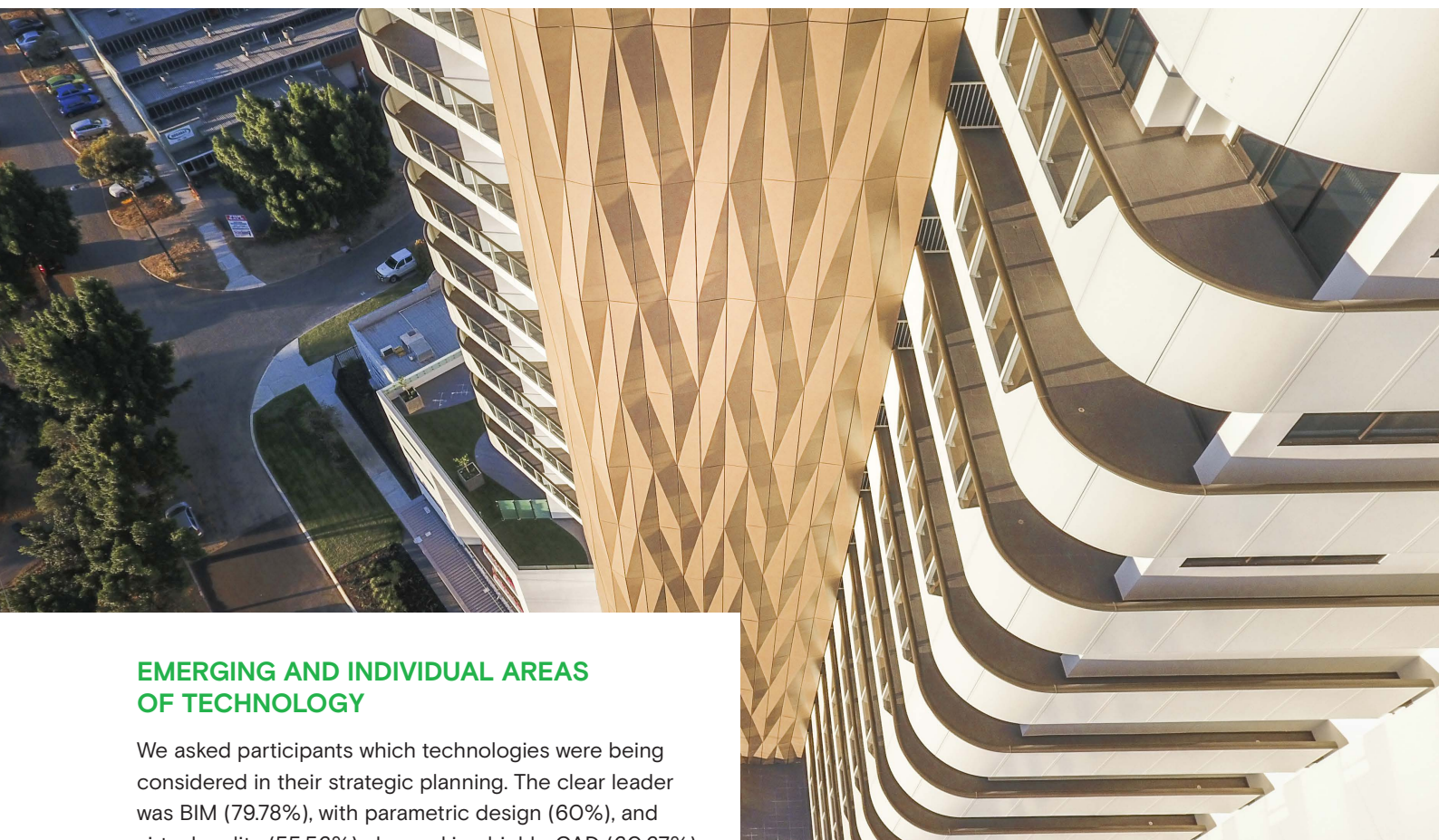Type: Integrated Public Artwork
Artist: Rick Vermey
Design Assist: Intensive Fields Lab (if/LAB)
Architect: Woods Bagot
Client: Norup + Wilson
–
Photography: Daniel Giuffre

EMERGING AND INDIVIDUAL AREAS OF TECHNOLOGY

We asked participants which technologies were being considered in their strategic planning. The clear leader was BIM (79.78%), with parametric design (60%), and virtual reality (55.56%) also ranking highly. CAD (60.67%) continues to be high on the list of technologies used, albeit on a downward decline.

Certain early adopters noted that they were already considering artificial intelligence (30%) and blockchain (13%), although it is unclear in which capacity. 28.9% of respondents were considering Design for Manufacturing and Assembly (DfMA), possibly as a result of state government initiatives such as the Schools Infrastructure NSW & VIC Schools, which focus on projects for DfMA construction.[6] Robotics and digital fabrication remain the most niche with only 12% of respondents considering it in their strategic planning.

"

ACROSS ALL BUILDING TYPOLOGIES IF THEY ARE EDUCATED AROUND THE MATTER AND ALSO ARE SHOWN THE VALUE IT BRINGS.

"

6. SINSW 2020 Delivery Strategy

Regardless of the technologies implemented, it is evident that organisations are not actively marketing their use of technology well. A mere 25.56% of respondents were marketing their BIM capabilities, even though 68.89% of clients asked them about their capabilities. We see significant room for improvement in this area as organisations embrace the challenge of educating their clients to see better returns on their technological investments.

As we drill down into the strategic planning of practices under 100, 101–500, 501+, readers of this report may notice some surprising results particularly for practices under 100. It should be noted that respondents of this survey are attracted to and influenced by design technology, therefore we anticipate that survey results are not reflective of the profession as a whole, but rather a pool of practices with design technology capabilities and interests of varying levels. This is important to remember for those of you who would like to use this data to benchmark against your own practice.

BIM

BIM service opportunity

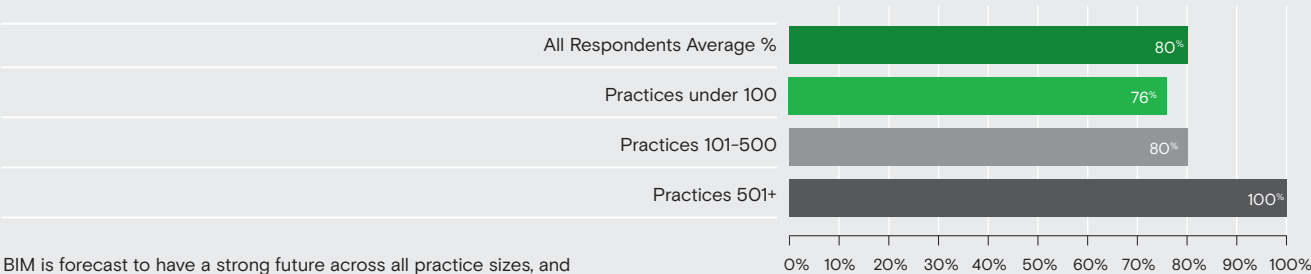|	
We currently sell (and will continue to) services using technology	56%
This technology is not relevant to our client service offering	13%
We identify future opportunity and are trying to sell	31%

BIM in strategic planning by practice size.

All Respondents Average %	80%
Practices under 100	76%
Practices 101–500	80%
Practices 501+	100%
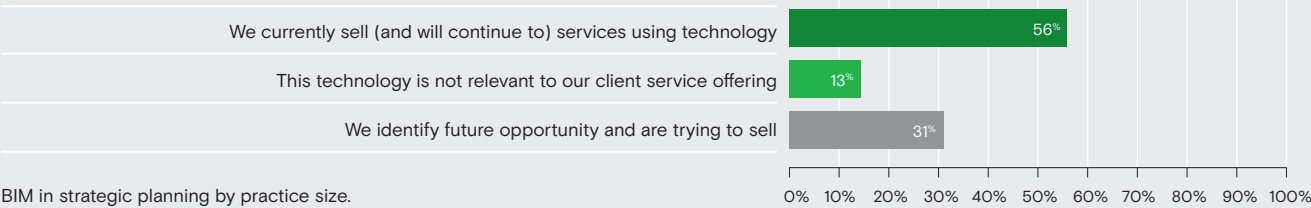
BIM is forecast to have a strong future across all practice sizes, and is considered strategically as a future revenue stream.

CAD

CAD service opportunity

We currently sell (and will continue to) services using technology	61%
This technology is not relevant to our client service offering	24%
We identify future opportunity and are trying to sell	15%

CAD in strategic planning by practice size.

All Respondents Average %	61%
Practices under 100	62%
Practices 101–500	60%
Practices 501+	57%
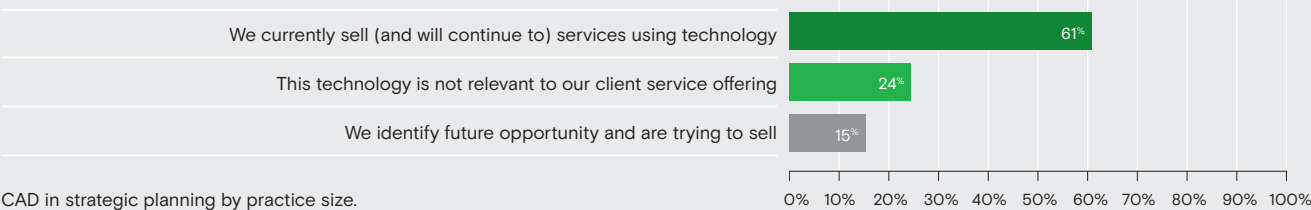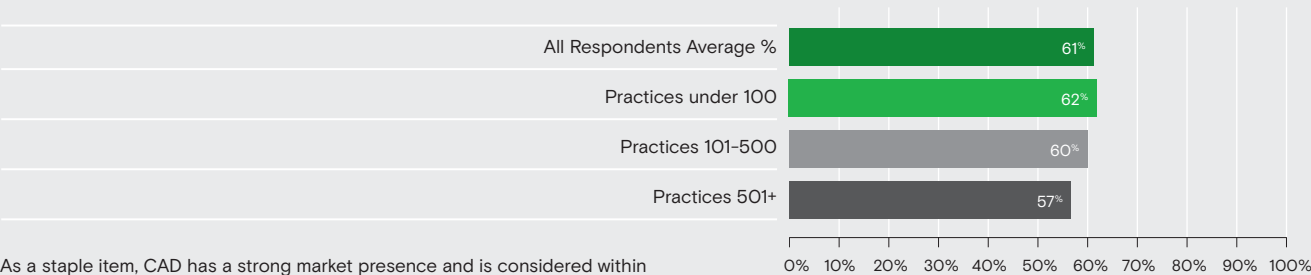
As a staple item, CAD has a strong market presence and is considered within the strategic planning of practices across sizes. We can see a decline in the consideration of CAD both generally but also as practices increase in size.

PARAMETRIC DESIGN

Parametric Design service opportunity

We currently sell (and will continue to) services using technology	44%
This technology is not relevant to our client service offering	33%
We identify future opportunity and are trying to sell	23%

Parametric design in strategic planning by practice size.

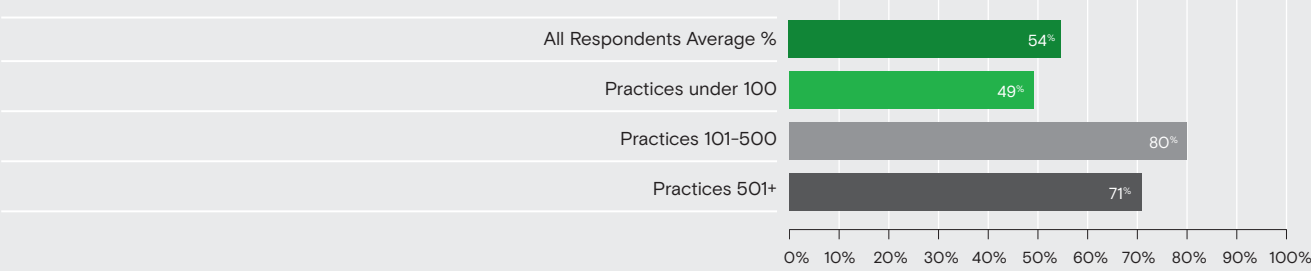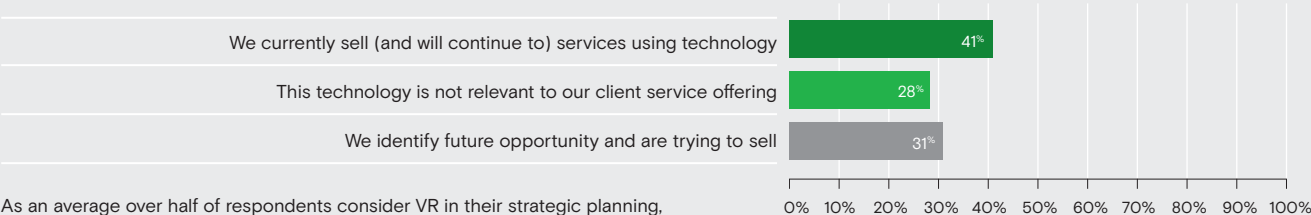|	
All Respondents Average %	60%
Practices under 100	55%
Practices 101–500	60%
Practices 501+	57%
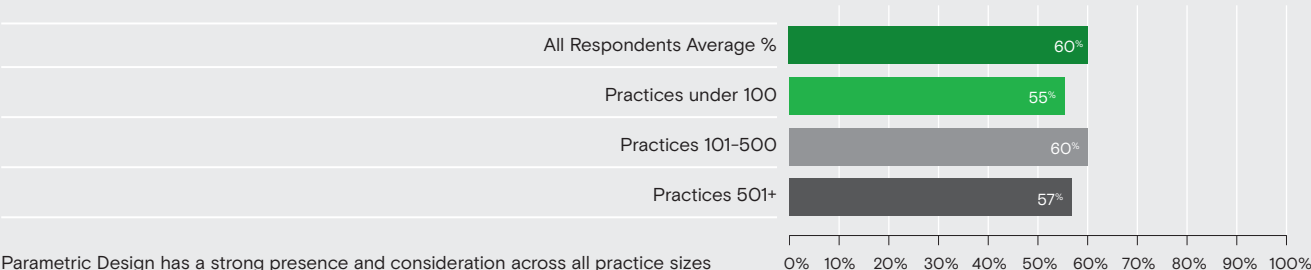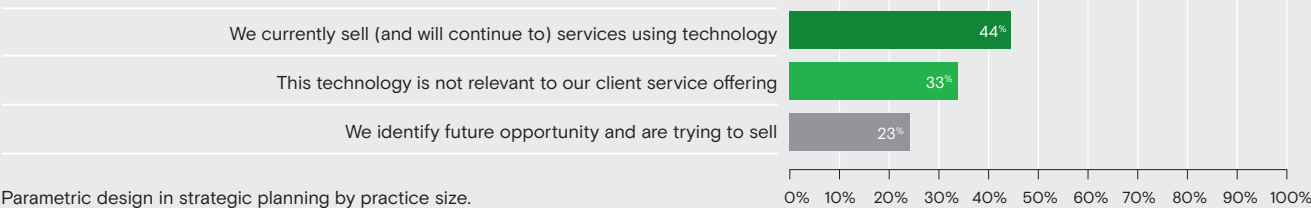
Parametric Design has a strong presence and consideration across all practice sizes with 44% of all respondents currently selling these services and approximately 50% of all respondents considering the service in strategic planning.

VIRTUAL REALITY

Virtual Reality in strategic planning

All Respondents Average %	54%
Practices under 100	49%
Practices 101–500	80%
Practices 501+	71%

Virtual Reality service opportunity

We currently sell (and will continue to) services using technology	41%
This technology is not relevant to our client service offering	28%
We identify future opportunity and are trying to sell	31%

As an average over half of respondents consider VR in their strategic planning, however when we drill down into this from the perspective of practice sizes, we can see an increase of consideration in strategic planning within the larger practices. 41% of respondents are currently selling these services, with 31% currently unable to but trying to include this within their future service mix. 28% see no service opportunity now or in the future.

COMPUTATIONAL DESIGN

Computational Design in strategic planning

All Respondents Average %	48%
Practices under 100	38%
Practices 101–500	60%
Practices 501+	93%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
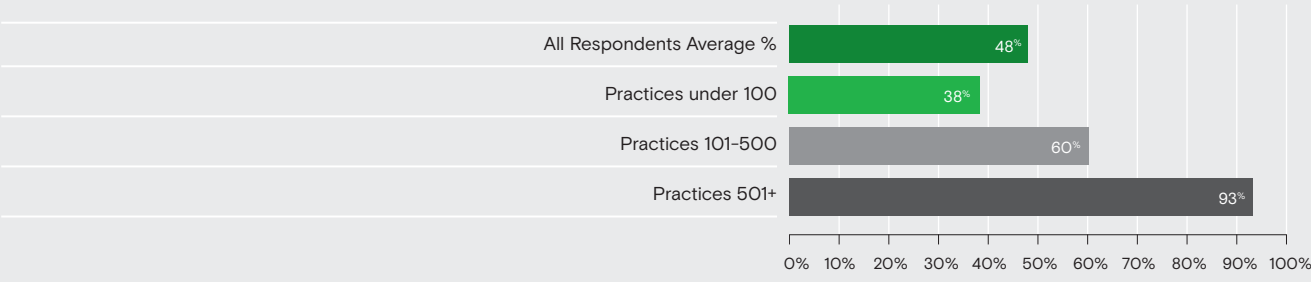
Computational Design service opportunity

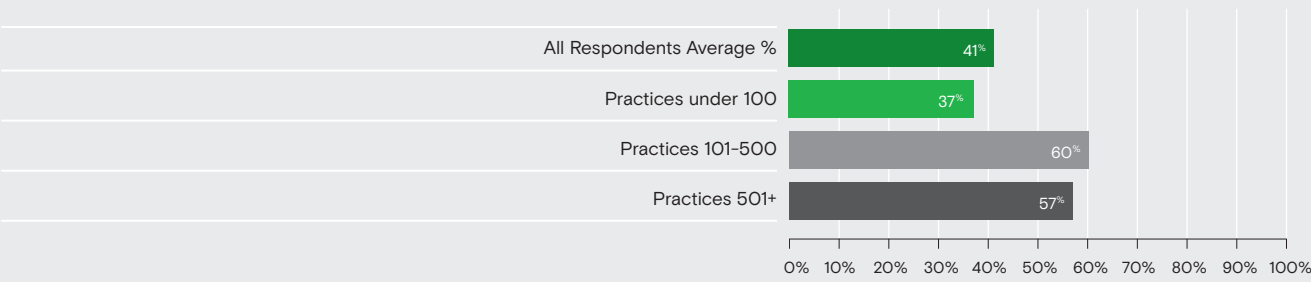|	
We currently sell (and will continue to) services using technology	39%
This technology is not relevant to our client service offering	31%
We identify future opportunity and are trying to sell	30%

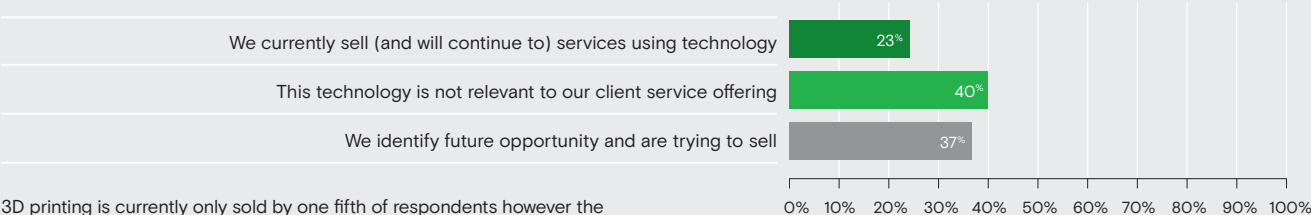0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
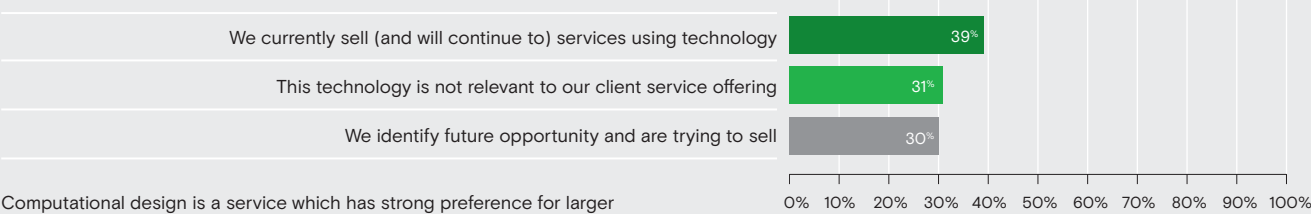
Computational design is a service which has strong preference for larger practices. The average response across all respondents for considering computational design in strategic planning was 48%, this increases dramatically to 93% when looking at practices of 500+.

3D PRINTING

3D Printing in strategic planning

All Respondents Average %	41%
Practices under 100	37%
Practices 101–500	60%
Practices 501+	57%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3D Printing service opportunity

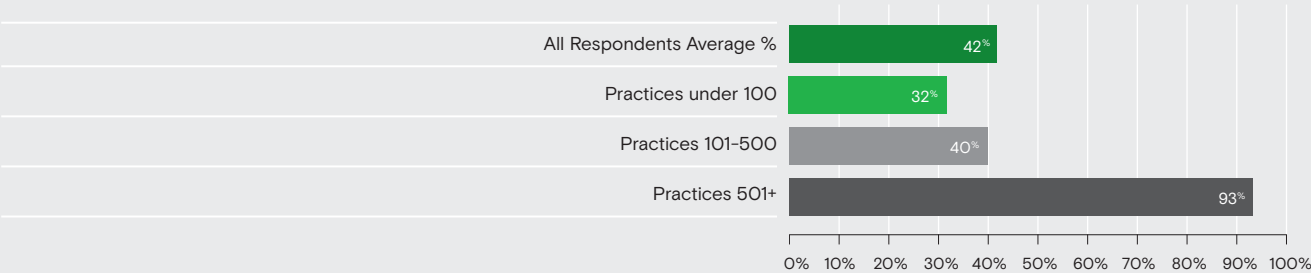|	
We currently sell (and will continue to) services using technology	23%
This technology is not relevant to our client service offering	40%
We identify future opportunity and are trying to sell	37%

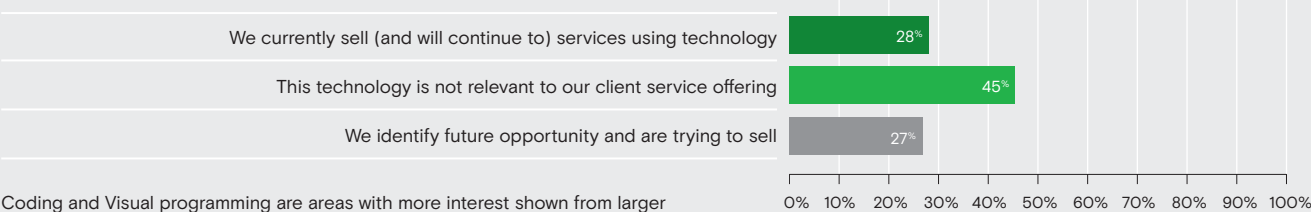0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3D printing is currently only sold by one fifth of respondents however the technology is forecast to have a stronger future with 37% of respondents identifying and actively chasing future fees in this area. Again we can see this having an increased focus for larger practices.

CODING & VISUAL PROGRAMMING
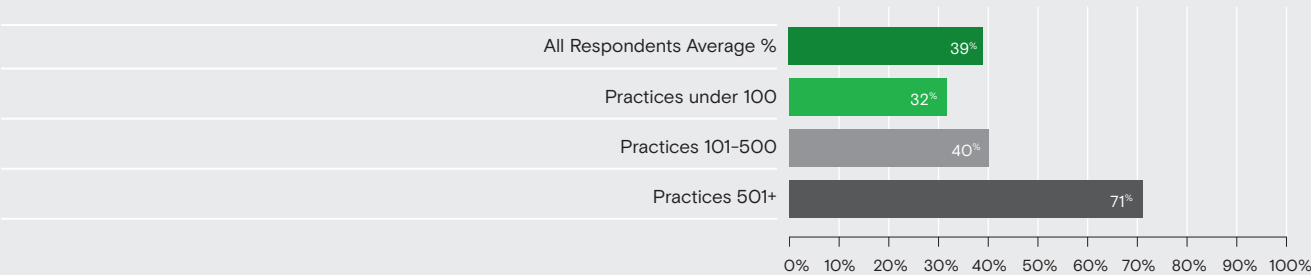
Coding/Visual Programming in strategic planning

All Respondents Average %	42%
Practices under 100	32%
Practices 101–500	40%
Practices 501+	93%

Coding/Visual Programming service opportunity

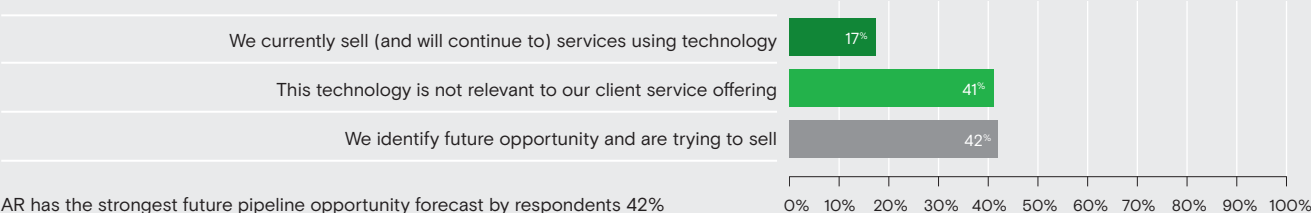|	
We currently sell (and will continue to) services using technology	28%
This technology is not relevant to our client service offering	45%
We identify future opportunity and are trying to sell	27%

Coding and Visual programming are areas with more interest shown from larger practices and 28% of respondents overall generating current fees in this service area. A steady future opportunity has been forecast by respondents.

AUGMENTED REALITY (AR)

Augmented Reality in strategic planning

All Respondents Average %	39%
Practices under 100	32%
Practices 101–500	40%
Practices 501+	71%

Augmented Reality service opportunity

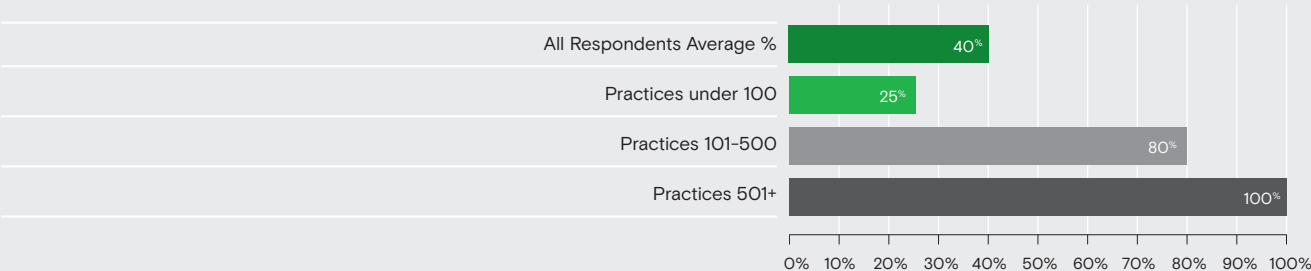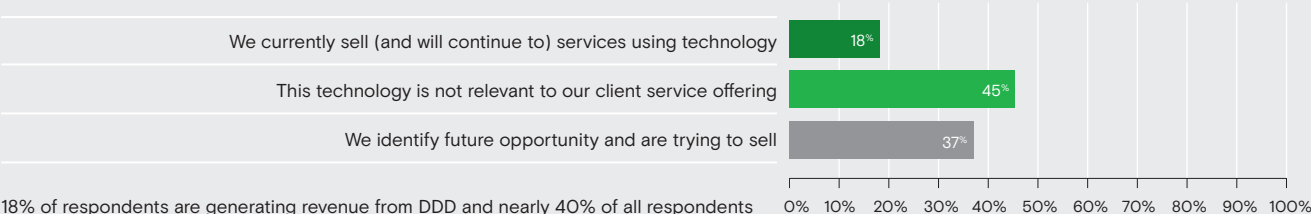|	
We currently sell (and will continue to) services using technology	17%
This technology is not relevant to our client service offering	41%
We identify future opportunity and are trying to sell	42%

AR has the strongest future pipeline opportunity forecast by respondents 42% and a relatively large amount of practices currently generating fees from this service area 17%.

DATA DRIVEN DESIGN (DDD)
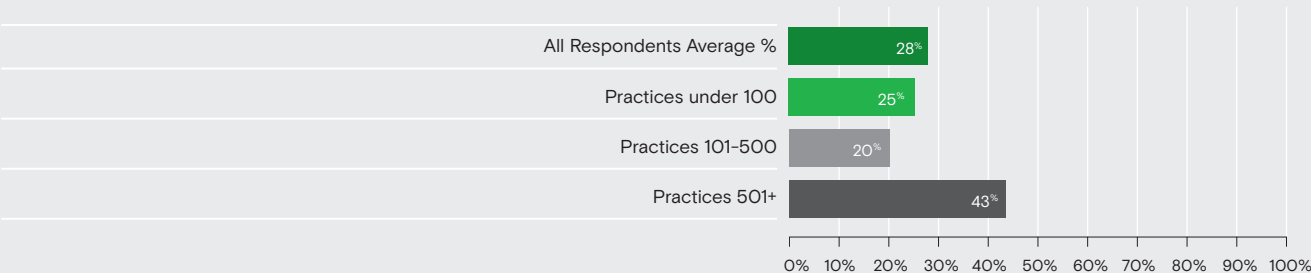
Data Driven Design in strategic planning

All Respondents Average %	40%
Practices under 100	25%
Practices 101–500	80%
Practices 501+	100%

Data Driven Design service opportunity

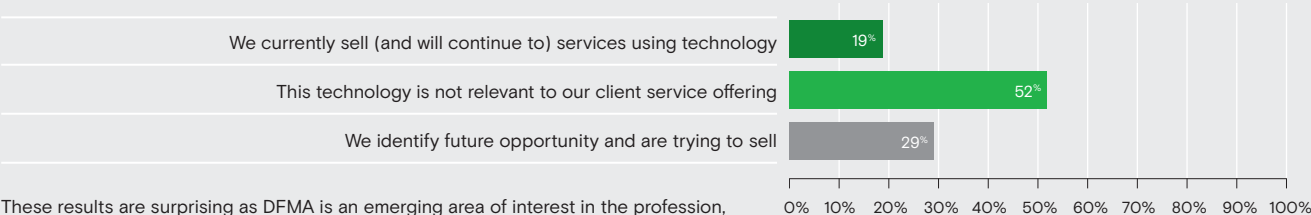|	
We currently sell (and will continue to) services using technology	18%
This technology is not relevant to our client service offering	45%
We identify future opportunity and are trying to sell	37%

18% of respondents are generating revenue from DDD and nearly 40% of all respondents forecast future revenue in this area, and 100% of responding practices with over 500 employees include this service in their strategic planning. 80% of respondents working for practices with 100–500 employees are considering DDD within their strategic planning, and 25% of practices that employ less than 100.

DESIGN FOR MANUFACTURE AND ASSEMBLY (DFMA)

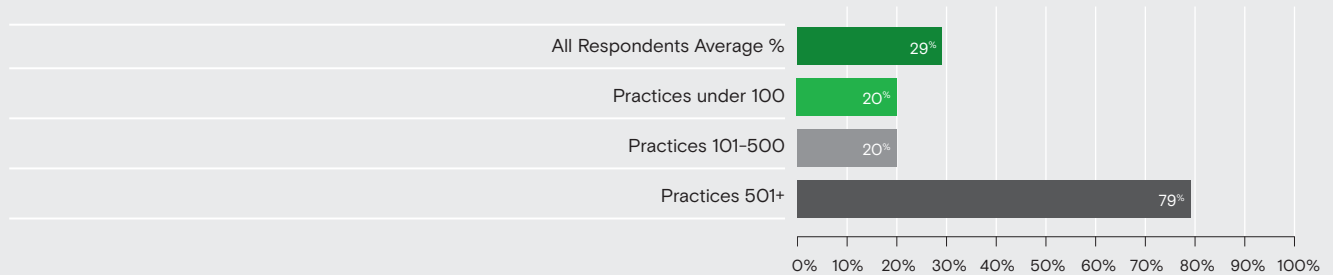## Design for Manufacture and Assembly in strategic planning

All Respondents Average %	28%
Practices under 100	25%
Practices 101–500	20%
Practices 501+	43%

Design for Manufacture and Assembly service opportunity

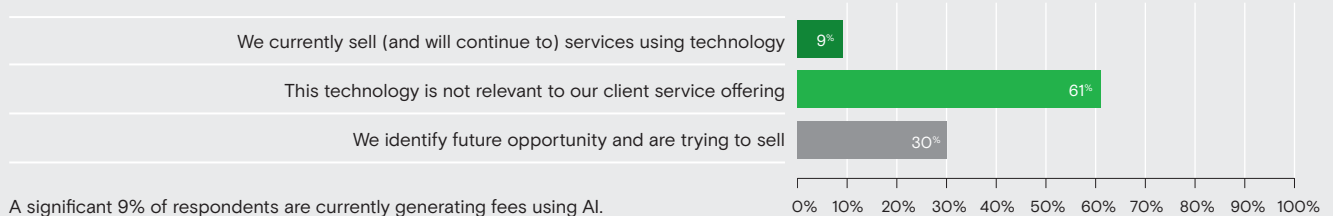|	
We currently sell (and will continue to) services using technology	19%
This technology is not relevant to our client service offering	52%
We identify future opportunity and are trying to sell	29%

These results are surprising as DFMA is an emerging area of interest in the profession, of those who are exploring the area there is stronger interest in smaller practices than anticipated with one quarter of those who are incorporating DFMA in their strategic planning practices with less than 100 employees. This may be influenced by the trend we have seen with school agencies.

ARTIFICIAL INTELLIGENCE
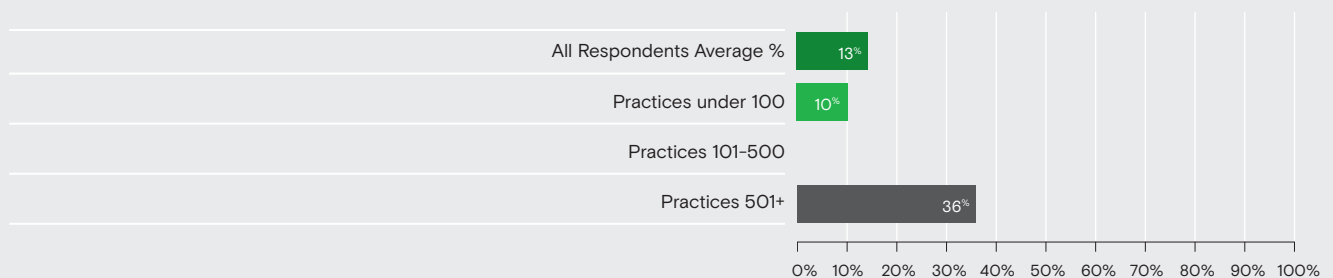
Artificial Intelligence in strategic planning

All Respondents Average %	29%
Practices under 100	20%
Practices 101–500	20%
Practices 501+	79%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Artificial Intelligence service opportunity

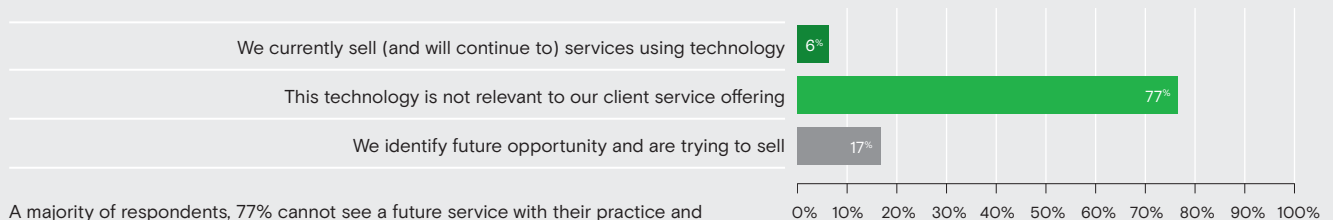|	
We currently sell (and will continue to) services using technology	9%
This technology is not relevant to our client service offering	61%
We identify future opportunity and are trying to sell	30%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

A significant 9% of respondents are currently generating fees using AI.
30% respondents are not currently selling services in this area, but they
forecast opportunities and are actively trying to. 79% of respondents that
are incorporating AI in their strategic planning employ 500+.
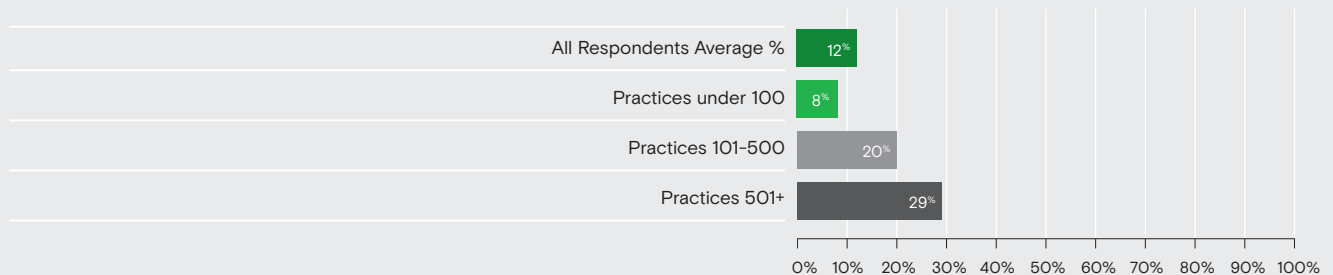
BLOCKCHAIN

Blockchain in strategic planning

All Respondents Average %	13%
Practices under 100	10%
Practices 101–500	
Practices 501+	36%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Blockchain service opportunity

We currently sell (and will continue to) services using technology	6%
This technology is not relevant to our client service offering	77%
We identify future opportunity and are trying to sell	17%

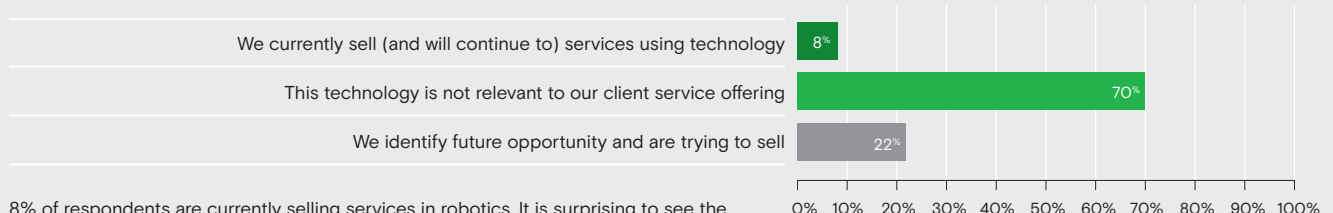0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

A majority of respondents, 77% cannot see a future service with their practice and
blockchain, however 6% are currently selling services with blockchain. 17% are not yet
selling services with blockchain, but they can see the opportunity on the horizon.
This technology is mainly considered by larger practices within their strategic planning,
however is is surprising to see that 10% of respondents worked for smaller practices.

ROBOTICS

Robotics in strategic planning

All Respondents Average %	12%
Practices under 100	8%
Practices 101-500	20%
Practices 501+	29%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Robotics service opportunity

We currently sell (and will continue to) services using technology	8%
This technology is not relevant to our client service offering	70%
We identify future opportunity and are trying to sell	22%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

8% of respondents are currently selling services in robotics. It is surprising to see the mix of practices incorporating robotics within their strategic planning. Assumedly due to their resources and client mix, practices with 500+ staff demonstrate a strong interest in most emerging technologies, yet show a limited interest in robotics.

STRATEGIC PLAYS

The built environment is experiencing widespread digital revolution, and architecture is not a protected realm. Design automation is on the increase, which is pushing practices to explore their service offering. Holding onto the fees gained by the "grunt work" will not only put your practice at risk, but also impact the quality of staff your practice attracts and retains.

Within large Australian practices, it is clear that some organisations have already moved well beyond basing their core business solely on the provision of architectural design services. For example, BVN have invested heavily in robotic fabrication , while Woods Bagot launched ERA-co, a consultancy merging user strategy and brand experience. Then we have Hassell's "experience masterplanners" at Freestate.

As organisations speculate about the potential of emerging technologies, it is imperative not to underestimate the potential of tomorrow's applications by evaluating them in terms of today's technologies. This cognitive bias is known as 'technological myopia' and it can hinder how and where we invest our resources. As Moore's Law predicted, computational power is exponential, doubling every two years. To put that in context, from 1950 to 2000 computational power increased roughly by a factor of 10 billion. So just because we have insufficient computational power today, doesn't mean that it won't exist tomorrow. Architectural firms should embrace the potential of emerging technologies by deeply entwining it into their business models.

7. Kaji-O'Grady, S. & Stead, N. (Jul/Aug 2018). Research in large Australian practices: A roundtable discussion. In Architecture Australia: Celebrating Alexander Tzannes, pp.66-70.

8. Dagmar Reinhardt, D. et al (2018). Design research between academia and practice: Systems reef: Developing a robotic, carbon-fibre wound, integrated ceiling structure.

9. Susskind, D. (2020). A world without work: Technology, automation, and how we should respond. Penguin Books, London, p.30.

EIGHT COMPARING THESE RESULTS WITH NBS UK RESEARCH FINDINGS

David Bain, Research Manager – NBS United Kingdom compares the findings of this report with UK studies undertaken by NBS.

We are very glad to be working with the Australian Institute of Architects to support this research about BIM and grateful for the opportunity to contribute to this report.

At NBS, we have been monitoring the take up and evolution of BIM for over a decade. Over this time, we have carried out surveys with built environment professionals in the UK, Australia, Canada, Japan, New Zealand and several European countries. Here, we take a look at the results from this AIA survey and make some observations in the context of previous surveys in Australia and the UK. We undertook a similar survey in Australia and New Zealand in 2019[10], our 10th BIM survey in the UK in 2020[11] and we have just published the results of our 2021 Digital Construction survey. Our surveys included a range of professionals and project roles. For our UK–focused surveys, there were sufficient numbers of architects that allow us to pull out findings for that profession only, for direct comparison with the AIA survey. This was not the case for our 2019 survey in Australia and New Zealand, so we have just reported findings for all respondents for that survey. Also, while many of the questions in the AIA survey covered similar themes to our surveys, very few used exactly the same wording, so some comparisons are indicative rather than direct.

8.1 THE ADOPTION OF BIM

Among all architects completing this year's Digital Construction survey, 76% have adopted BIM for at least some of their projects. The figure is the same for those architects in the UK only. In 2020, 27% of UK architects (that had implemented BIM), did so for all of their projects. And in 2019, 80% of professionals in Australia and New Zealand told us they had adopted BIM; 27% for all their projects. So adoption was high then too but there are signs in the new AIA survey that this uptake has increased. The 2021 survey with Australian architects shows that they expect to continue embedding BIM: in five years' time 56% anticipate using BIM for all their projects. We've seen this intent, too, over the years in the UK, although the reality does lag behind, with a gradually shrinking minority who are yet to implement BIM.

So, in terms of the proportion of architects using BIM regularly on their projects, this latest AIA survey in Australia does indicate that BIM maturity may be on a par or even ahead of where it is in the UK. At the same time, we have observed in the UK that, while the high level figures can paint a picture of industry–wide BIM adoption, when you look deeper there are disparities. Smaller practices are less likely to have adopted BIM: 58% of those in the UK with 15 employees or fewer say they have adopted BIM; 18% say they will never do so. And reading some of the comments people make in our surveys, the benefits are not always as clear for those working on small, domestic projects.

On the whole, architects in Australia appear to see BIM as a process (85%), similar to the 92% of professionals from our survey in the region in 2019. Conversely, almost a third (31%) still equate BIM with Revit or other similar platforms. The perception of BIM as being synonymous with 3D modelling has lingered too in the UK but gradually fallen to 22% of architects thinking this. Many more view BIM as following information management processes as defined in standards like the BS/PAS 1192 (45%) or international ISO 19650 series (25%).

8.2 PERCEIVED BENEFITS

One of the consistently recognised benefits of BIM has been that it results in operation and maintenance savings: in our most recent UK–focused survey, 64% of architects agreed with this, and in the 2019 ANZ survey, it was higher, at 79%. It is interesting, therefore, that slightly fewer (60%) of architects in the AIA survey share this view. However, on other points, there is much agreement: 69% said BIM has brought cost efficiencies, a little higher than the 63% in the 2019 ANZ survey. Just over half (51%) say it has increased their profitability, up from 44% in 2019, also higher than it was among UK architects in 2020.

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10. The majority of respondents were in Australia.
11. The majority of respondents were in the UK but some were in other countries.

8.3 CHALLENGES AND ENABLERS

There are similar challenges to adopting BIM in Australia and the UK. In our UK survey, the main barriers have consistently included: lack of in-house expertise, lack of training and cost. All three of these feature in the top half a dozen barriers cited in this year's Australian survey. There were also many similarities with the 2019 ANZ survey. There were some differences, however. Lack of client demand is often highlighted in our surveys, whereas little over a quarter of architects in Australia cite this as a barrier. Also, a number of UK architects answering our survey have said that their projects are too small for BIM or it's not relevant to them. Few seem to mention this in this latest Australian survey.

Even though lack of client demand doesn't seem to feature so heavily here, there are signs that clients can help to enable BIM. Many feel that clients do not understand the benefits of BIM and 57% that clients are not willing to financially invest in it. Market and client education are also the favoured actions to encourage BIM, as opposed to a federal mandate. Lack of client knowledge about BIM has been a theme in the UK. Clients are aware of it and often require it but without always understanding what that means in terms of stating their information requirements and playing their part in the process. In the public sector, much was made of the UK Government's BIM mandate in 2016 and it's very likely that this played a key role in stimulating the take up of BIM – we saw a rise in adoption around that time.

Maber Architects have used cloud-based software (NBS Chorus) to create a specification and integrate it with their 3D model, also managing information following BIM principles and processes.

However, there were mixed views on the effectiveness of government in enforcing and driving BIM after the mandate and we found in our 2020 survey that BIM projects were just as likely to take place in the private sector as the public. It seems that many private clients have seen how BIM can benefit them. We are also aware of architectural practices that made it their policy to embed BIM into all projects, regardless of client requirements.

While lack of expertise is cited as a challenge, most architects responding to the AIA survey appear to be confident in their knowledge of BIM. Resource is clearly being allocated to BIM and digital technology, with many having a dedicated BIM resource and responsibility for it at senior leader level.

8.4 THE ROLE OF MANUFACTURERS

Manufacturers providing their product information in the form of BIM models is clearly welcomed by architects, with 88% saying it helps when they do this. While asked differently in our past surveys, the sentiment was similar: 73% of 2019 ANZ survey respondents said they needed manufacturers to provide BIM objects; this was 77% among UK architects in our latest survey. In this year's Australian survey, architects were almost unanimous in their agreement that the usage of BIM would be enhanced if manufacturers used a globally accepted standard to demonstrate that their content is standardised. In the UK we have seen a continued desire from the design community for standardised information that makes it easier for them to find the information they need, interpret it and benefit from the fact that everyone else is following a similar way of working.

In AIA's parallel survey with manufacturers, we see that almost three quarters appear to be providing BIM content. For many, this seems to take place in response to requests as opposed to being part of a proactive marketing strategy. However, over four fifths say provision of data in this format is part of a long term business plan. These findings indicate a recognition among manufacturers that BIM is significant and that it is in their interest to provide product data in a format that supports it. However, it also suggests that there is work to do for this to become the norm across manufacturers and products. In the UK, we see many examples of manufacturers investing heavily in producing standardised, high quality digital objects for designers. Although there is recognition among the design community and among manufacturers that a lot more can be done. The different interpretations of BIM have sometimes muddied the waters when manufacturers have sought to understand the most useful information to provide. This is another argument for standardisation.

8.5 THE FUTURE AND OTHER TECHNOLOGY

Looking beyond BIM, some of the technologies that architects in Australia appear to be considering focus around bringing enhancements and automation to the design process – using parametric and computational design. Virtual and augmented reality also appear to be on the horizon: there is take up of this in the UK too, although not as rapid as for other innovations, with 45% of UK architects saying they use this kind of immersive tech. In the UK there has been a recent drive to encourage offsite construction / design for manufacture, supported by the government. In our most recent survey, 45% of UK architects said they were recently involved in a project that included an element of offsite construction. The Coronavirus pandemic, restricting access to site, has placed increased emphasis on the approach. However, design for manufacture doesn't appear to feature as prominently in Australia at present. Perhaps the changeable British weather makes the prospect of being able to manufacture components in factory conditions more appealing, and necessary!

More broadly, some of the big themes are similar in Australia as in the UK. These include the importance and desire for increased collaboration and the need to design more sustainably: 68% of UK architects believe that digital technologies are having a positive effect on environmental sustainability. In our UK survey, we have seen the uptake of cloud computing platforms (85% among UK architects), with two-thirds saying that the adoption of digital tech has been accelerated by the Coronvirus pandemic. 65% of UK architects now expect to split their time between home and office over the next five years. At NBS, we are pleased to have supported this need with our two cloud-based platforms, NBS Chorus for specification writing and NBS Source, providing structured manufacturers' product data. Both can be used on any device in any location with an internet connection. They also integrate with 3D design tools like Archicad and Revit. Through these tools and our experience of digital technologies, we look forward to supporting digital transformation in the Australian built environment.

ACKNOWLEDGEMENTS

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PROVIDE YOUR FEEDBACK

The Institute and NBS would like your feedback on this report and what future data could be collected and actions could be taken. We've created an online collector for you to provide this simply by clicking here:

https://www.surveymonkey.com/r/DMZWXH9

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