University of Southern Queensland
Faculty of Health, Engineering and Sciences

Building Information Modelling (BIM) and its adoption and effectiveness as a tool in the management of constructions projects in Australia.

A dissertation submitted by
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Abstract

Key Words: Building Information Modelling, BIM, BIM Adoption, Construction, BIM Management

Across Australia every year billions of dollars of construction works are completed for clients from both the public and private sectors. The Australian Industry and Skills Committee (2020) says the total producing around $360 billion in revenue or approximately 9% of Australia's GDP (Gross Domestic Product). Close management of these projects is required to ensure they meet the requirements of their clients. Managing projects is not a perfect science and can have inefficiencies which are recognised through means of using what would be considered traditional management techniques.

The last several decades has seen the introduction and uptake of BIM or Building Information Modelling into the AEC industry in Australia. This report undertakes research for the purpose of understanding BIM as an effective management tool and the adoption of BIM in the AEC (Architecture, Engineering and Construction) industry in Australia. This report overviews the literature in this area of research, looking into the effectiveness of BIM as a management tool and adoption rates within the AEC industry in Australia. The literature review highlighted small but significant knowledge gaps regarding as a result of what is perceived to be limited study in this area over the last decade.

The study aims to take a snapshot of the current AEC industry in Australia to better understand if BIM is used for the delivery of projects within the country. This report also outlines the methods implemented to achieve the projects research objectives and identifies the resources that will be required to achieve these outcomes. Both quantitative and qualitative data was collected through the way of various methods with a range of industry professionals participating in the research.

The results and discussion highlight the findings of the research and BIM (Building Information Modelling) and though it is perceived that BIM might not be used to its potential in Australia it is used in many instances to manage projects and continues to be adopted throughout the country.

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Certification

I certify that the ideas, designs and experimental work, results, analyses and conclusions set out in this dissertation are entirely my own effort, except where otherwise indicated and acknowledged.
I further certify that the work is original and has not been previously submitted for assessment in any other course or institution, except where specifically stated.

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Signature

_____

Date

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Glossary of terms:

AEC – Architecture, Engineering and Construction

PMBOK – Project Management Book of Knowledge

BIM – Building Information Technology

FGI – Focus Group Interviews

PMI – Project Management Institute.

IPD – Integrated Project Delivery

Chapter 1 – Introduction

1.1 Project Background

Every year billions of dollars are spent on infrastructure and construction projects in Australia**.** With the volume of money which is spent on these construction and infrastructure projects in both the public and privates' sector clients it is important that they can be adequately managed. Different methods, tools and aids are often used in the management of these projects, with some being in existence since the earliest recordings of formalised project management methods and others coming along in more recent times. One such recent trend in the management of construction projects in Australia is the introduction of BIM tools and techniques as a way of managing projects. Despite the advancements in technologies and techniques which have been adopted to manage projects over the years BIM has been one which has not been perceived to be adopted as freely by some members or areas of the AEC industry as others. The current use of BIM within the industry has been researched however it is difficult to determine some of the factors which impact how it has been adopted across the industry and whether its benefits outweigh what would be considered traditional means of project management.

One of the limitation of BIM implementation is often said to be caused by factors like the lack of training and experts in the field are elements as to what holds backs either individuals or businesses investing further into BIM and its benefits in the management of constructions projects in the AEC industry. The following proposal covers the research into the effectiveness of BIM as a project management tool in the Australian construction industry and looks to explore trends regarding how, where and why it has or on the contrary has not been adopted across the AEC industry in Australia.

1.2 Idea Origination

The idea for this research topic was based on several factors including, previous academic learnings in the area of project and construction management. However, the main catalyst was the personal experience working within construction and project management/coordination roles in the AEC industries over the past decade. The constant pursuit of delivering projects on time, within budget and to a high quality are pressures that project managers and their teams face daily. It is important that the tools and techniques used by project teams offer them the best possible opportunity to meet these deadlines by making the construction lifecycles and

processes as efficient as possible. Working in the industry led to the realisation that there were many inefficiencies in these projects which used what would be considered traditional means and methods of project management which could be improved by the use of a collaborative method like BIM where important project data for all stages can be documented and stored efficiently for the purpose of managing the project. My lack of actual tangible experience with the utilisation of BIM on real life projects despite being in industry for a decade and the combination of the factors aforementioned was the key for the origination for this as a research topic which would provide beneficial insight into this side of the AEC industry in Australia.

The primary reason for the research is to determine whether BIM really can be considered an effective management tool and how it has been adopted as such within the Australian AEC industry. The research intends to provide credible results from sources that reflect the industry and its utilisation of BIM. This research would ultimately help to clear up some of the myths that may be held around BIM that may be held within the construction industry in Australia.

1.3 Project Aims and Objectives

1.3.1 Project Aim

The aim is to evaluate BIM and how its implementation impacts and influences performance in the management of construction projects in Australia and to determine whether BIM is used effectively in the management on projects in Australia. By understanding the implementation and influence of BIM on Australian construction projects the underlying causes regarding adoption of BIM across the industry can be further examined.

1.3.2 Project Objectives

The following details the objectives have been set for this research topic

1. Understand how BIM is utilised in the management of construction projects in Australia.
2. Understand the effectiveness of BIM as a management tool on Australian construction projects and the benefits compared to traditional management methods.
3. Evaluate the impacts, advantages and disadvantages of using BIM to manage Australian construction projects.

4. Assess how BIM has been adopted by the Australian construction industry and the underlying positive and negative causes of adoption rates of BIM in the Australian construction industry.

1.4 Research Scope

Due to the limitation of the project expressed above this research will only focus on collecting data from certain firms and business within the industry. This is to ensure that the time constraints can be met and that no extensive costs are to be incurred in the research. Research will include an extensive literature review and industry professional surveys/interviews in the aid of collecting industry specific data for analysis, so that it meets the specific requirements and needs of the Australian construction Industry. Other questions or topics related to the topic of BIM that fall outside of the objectives of the project will not be considered or targeted in this research. Whilst this scope of works is somewhat limited, it allows for adequate research into the AEC industries in Australia on this subject matter at an undergraduate level.

1.5 Benefits and Outcomes Research

Through this research both the desired and expected outcome is to provide a deeper more clear understanding of the use of BIM in the management of Australian construction projects and understand how the technology has been adopted across the AEC industries since its introduction a number of decades ago. As the research is being conducted specifically within the confines of the Australian AEC industry it is expected that the research will specifically benefit this area and would ultimately be able to be applied to the industry as knowledge to be considered credible and reliable. Therefore, the expectations are that the results of this research will be able to be applied majority of Australian construction, engineering and architecture companies projects which as a minimum currently use traditional methods for the purpose of managing these projects.

In undertaking this project, the desire is to provide and offer credible data and findings about the use of BIM in the AEC industry and impacts it has on the business who utilise it in management of their construction projects.

1.6 Consequential Effects of Research

As highlighted by the aims and objectives of this research topic there will be outcomes and findings which are a consequence of the research undertaken in the pursuit of meeting these

desired outcomes. This research is the authors own work (unless where otherwise stated or referenced) and materials produced will be the responsibility of the author. To ensure that the research is credible and can be trusted by peers, industry professionals, the public or anybody else who reads the research it is important to identify the potential consequences or risk of the research being conducted.

Some of the possible consequences of research are highlighted below, the list doesn't necessarily cover them all and is not limited to those that have been noted below.

- Sustainability
- Economic Consequences
- Safety
- Ethical Consequences.

For the research undertaken for this particular project most project risk/consequences are mitigated by the fact that a new product, technique, mathematical model or environmental or sustainability frame work is not being develop for the use within industry and rather more of a snapshot of the industry is being developed from this research. However, this is not to say that there aren't consequences that can affect the research. Possible research related consequences are often highlighted in the form of risks and are assessed where the main effects of this are analysed and thus can have mitigation strategies implemented to eliminate or minimise the impact of that risk or consequence.

1.7 Ethical Responsibilities of Research

A component of the study includes collecting data from surveys and questionnaires. To ensure that those participants that are interviewed or surveyed are protected there will be a level of responsibility on the research which needs to be apply. An application to the USQ ethics board was made to ensure that no ethical boundaries were crossed in the undertaking of this research project. Survey and interviews of industry professionals only commence once formal approval is given by the Human Research Ethics board. See Chapter 3 -Methodology of this Report for further details

Chapter 2 – Literature Review

2.1 Knowledge Gap

The literature review below offers a clear insight into the research which has been conducted and the knowledge and information available about BIM in the AEC industry. It is clear however that research into BIM use and adoption specifically in terms of the Australian Industry is lacking. A paper from Gu et al. in 2008 titled '*Industry Perception of BIM Adoption in the Design Sector'* looked into the adoption of BIM within the AEC industry and a following paper in 2010 by Gu and London titled *'Understanding BIM adoption in the AEC'* again looked into BIM adoption and utilisation, however since the publication of these papers there appears to be a lack of research in this area from an Australian industry perspective. Examples of studies in other countries namely Middle Eastern Nations Saudi Arabia and Jordan in 2017 offered some insight into more contemporary studies related to this research. The 10-12 years between these studies means that a recent snapshot of the industry hasn't been gathered regarding BIM adoption and utilisation as a collaborative project management tool for the delivery of projects. Regarding the use of BIM as a management tool to deliver projects there is research in this area, again however lacking is specific contemporary research which explores the cultural specificities of the Australian AEC and the use of BIM in the industry. There are some good individual case studies which can be found by an overall study which covers an entire snapshot was difficult to come across. Research has been done in Australia regarding BIM however it often speaks to small specific corners of the market as opposed to the broad snapshot which this research is trying to achieve. Overall there has been research which has been conducted in the areas related to this study, however Australia research has been limited of late and while international based research does offer an idea about how BIM has progressed over the last decade it cannot be said that the trend would be similar in Australia. These gaps in knowledge allow for high quality research to be undertaken with focus on the Australia AEC specifically.

2.2 Literature Review

The following is a review of the literature, it identifies the keys areas of research that have been done in the area of BIM in the AEC industry related to the research topic. The literature review is based on sources which are commonly available and do not present any original ideas of the author. The review includes findings in the area of BIM as a component of project management and adoption rates and trends within the industry in order to establish context for this research.

2.2.1 What is BIM

Simply put BIM is an acronym which stands for Building Information Modelling. As BIM software have made their way into the industry since 1987 *(LetsBuild 2017)* with the introduction of ArchiCAD being the first BIM software available on a personal computer, it has become a point of interest in how it can be applied to help create efficiencies in the projects these businesses and firms undertake. The nature of BIM and the broad spectrum that it encompasses often means that it is defined by different entities and people in different ways dependant on how it is experienced by the user. Lorek (2018) broadly defines BIM as a collaborative process that allows multiple stakeholders to collaborate on planning, design and construction within a 3D model, also spanning the operation and management of a building. In a 2015 paper Rokooei references (*Words and Images,2009*) which defined BIM as a reliable, digital, three-dimensional, virtual representation of the project to be built for the use in design decision making, construction scheduling and planning, cost estimates and maintenance of construction projects. Whereas PMBOK defines BIM as a building modelling technology based on the relevant information data of a construction project. It is an advanced technology and management concept which is widely used in whole of life cycle process of planning, design, construction and operation *(Rokooei, 2015).* As is obvious from above different sources tend to define BIM ever so slightly differently, however all the given examples from each source are valid in their definition.

Quirk (2012) in a article for ArcDaily summarises BIM as a technology that can represent both physical and intrinsic properties of a building as an object -orientated model tied to a database. The user of BIM technology can interact with models in two and three dimensions and as a model is developed additional drawings will correspond by adjusting to the set parameters of the original design inputs. The set parameters will allow for constraints to be created to fit in with the intention of the design and thus creating a dynamic model which is tied to the data that has been input. Quirk (2012) highlights that an improvement in productivity has been seen over time with the rise of computer technology.

BIM is said to have a number of dimensions ranging from 3D through 7D each of the ‘dimensions’ represent level of capability that BIM technology has as a collaborative management technology and tool. BibLus defines these technical aspects or ‘dimensions’ as follows

- 3D – Three-dimensional modelling of the project.

- 4D – Duration (Schedule) Analysis
- 5D – Cost Analysis
- 6D – Sustainability Analysis
- 7D – Management phase of what has been achieved.

These dimensions play an important role in building the 'maturity level' of a BIM model, refer to the section below which goes into depth these technical aspects of BIM technology and what they represent.

2.2.2 BIM as an effective project management tool for delivering projects

In a paper entitled 'Building Information Modelling in Project Management: Necessities, Challenges and Outcomes it is highlighted that BIM is becoming a comprehensive collaborative process within the construction industry with its capabilities on these projects being one of the main driving factors (Rokooei, 2015)

Rokooei states that integrated project delivery (IPD) systems like BIM is an approach which is growing in the delivery of projects and that this approach unifies different disciplines and integrates all projects in its delivery, including project managers, designers, engineers and other project team staff members. It the paper states that this form of delivery (IPD) optimizes the value of the project by creating efficiencies through all project phases and encourages all parties to be involved in the project and its outcomes (Rokooei, 2015). The BIM tools used in this type of scenario enable a level of communication, visualisation and analysis in a holistic and cohesive way (Rokooei, 2015). In terms of IPD being used as a project management tool it offers a approach which results in advantages to the project in effectively being able to manage all aspects of a project including project review document tracking and even resolution that may arise from conflict within a project. Rokooei (2015) summarises by stating that IPD is an integrative approach and the BIM is the technological interface which can aid this process.

As BIM integrates and collaborates all aspects of the project life cycle it has processes in place to facilitate project documentation but also is used for technical aspects of projects as well. Lahdou and Zetterman (2011) in a paper titled *'How project managers can utilize BIM in construction projects'* highlight the key technical aspects of BIM

- Clash detections – aiding in being able to detect services and other clashes that may occur in the construction of a project. Helps to determine any overlaps helping project

managers to identify any issues which may arise during construction. *(Lahdou & Zetterman, 2011)*

- Analysis – Energy can be performed linking BIM to tools which analyse a building and measure energy usage. *(Lahdou & Zetterman, 2011)*
- Time estimation (4D) – This is where the objects in a BIM model can be linked to a schedule. This can help in visualisation of project schedule and can be used to simulate the construction at any given point in time. This allows for error detection and other planning mistakes which might be present within a project. *(Lahdou & Zetterman, 2011)*
- Cost Estimation (5D) – This where the objects and data in the 3D design can be connected with a price list of different materials for a project, where inputs of labour and equipment costs can also be input. This function allows for more accurate cost planning and can give greater insight into the financial implications of the project. This can also be helpful in the procurement of materials and minimisation of wastage. *(Lahdou & Zetterman, 2011)*

In addition to the above technical aspects Rokooei *(2015)* also includes:

- Constructability – Can help project teams and manager review and handle constructability issues before they occur on site. Visual models can also be generated to help in understanding these issues.
- Integration – The project can deal with and interact with a fully unified model allowing for greater collaboration, analysis, review and results whilst maintaining the integrity of the model.

Lahdou and Zettermans (2011) breaks down the BIM levels based on the maturity of a project, they summarise as follows

- Level 0 – Where 3D modelling is used in the design phase but there is not yet the coordination or connection between other models of differing disciplines
- Level 1 – This indicates a level where there is coordination between different disciplines now interconnected with task like clash control now being able to be performed.

- Level 2 – This includes the function of level one with the addition of input from more than one discipline. This might include elements like energy analysis and time and cost elements
- Level 3 – Reaching level three maturity inputs from both levels one and two are included with highly integrated and developed models between the disciplines. This might include advanced time and cost models and fully integrated maintenance models. Level three is there to represent the very top tier of the function of BIM technology.

The functions and different levels of BIM used as mentioned above offer many advantages in the delivery of a project. Qian (2012) summarises the advantages and benefits of BIM in project management as the following

- Enhanced project collaboration and control amongst stakeholders
- Improved productivity
- Better project quality and performance
- Faster project delivery
- Reduced Wastage
- Reduced Construction Cost
- New business opportunities

Qian (2012) summarised the following in a table by which he had the benefits and crossed check them across different information sources. The table and graph in the figures below below indicates a consensus on a large majority of the benefits the Qian included and the sources which highlighted similar findings. It was noted that this list was not exhaustive however did highlight the most mentioned benefits in this area of research.

Figure 2-1: Table indicating benefits of BIM in project management and the sources from which they are derived. (Qian 2012)

Benefits / Sources	Enhanced project collaboration and control among stakeholders	Improved productivity (less re-work, conflicts and changes)	Better project quality and performance	Faster project delivery	Reduced wastages	Reduced construction costs	New revenue and business opportunities
(ASHRAE, 2009)	√	√	√	√	√		√
(Azhar, Hein, & Sketo, 2008)	√		√	√			√
(Becerik-Gerber & Rice, 2009)				√	√	√	
(Beck, 2011)	√			√	√	√	
(buildingSMART, 2010)				√	√	√	√
(El Dado, 2011)	√	√	√	√		√	√
(Giel & Issa, 2010)		√	√	√			
(Han & Damian, 2008)			√	√	√	√	
(Hardin, 2009)	√	√	√	√			√
(Hergunsel, 2011)	√	√		√	√	√	√
(Hurley, 2008)				√	√	√	
(Rodriguez, 2011)	√	√		√	√	√	√
(Underwood & Isikdaq, 2009)	√	√	√	√	√	√	√

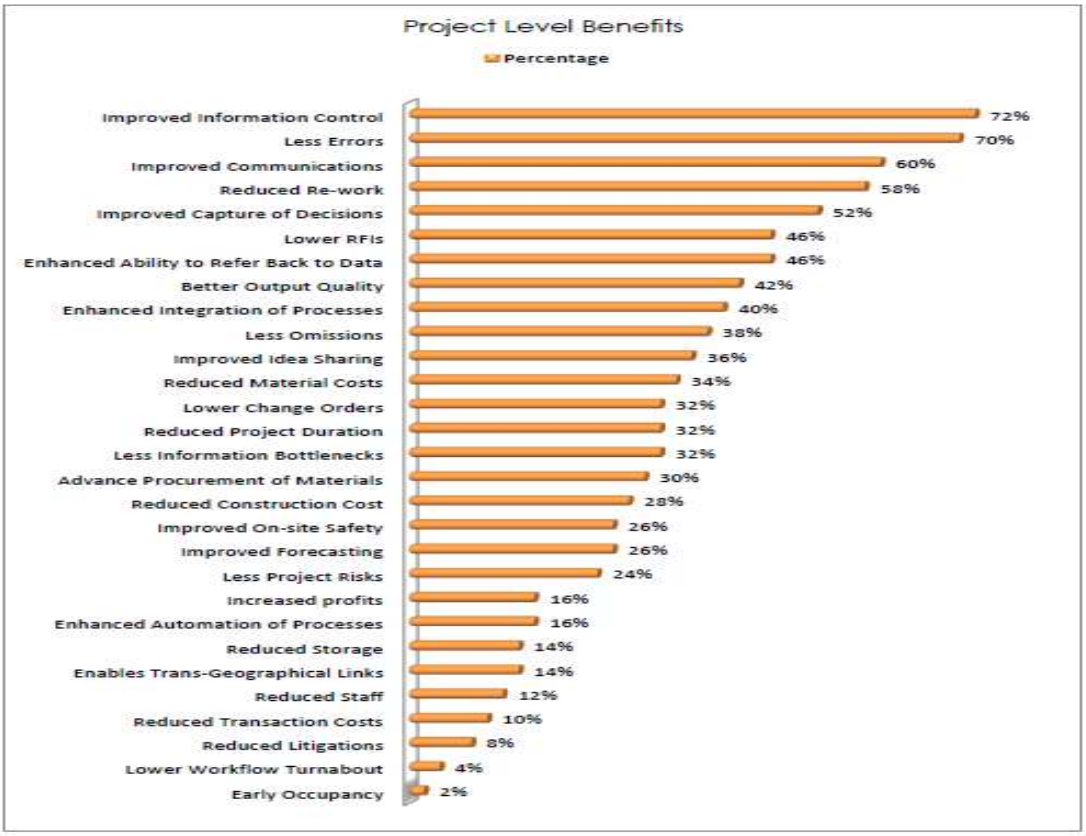

Figure 2-2: Graph indicating project level benefits derived from BIM (Qian 2012)

Qian (2012) concludes that based on his study that BIM is not the fix all for lack of productivity, experience or lack of knowledge in project management and that businesses must establish a link between the competencies of its practise and the use of BIM to ensure its benefits are felt. *Lahdou & Zetterman, (2011)* echo the sentiment of Qian to some degree in offering that project managers generally do not have the knowledge about BIM which makes it difficult for them to see the implementation and benefits that BIM can offer in delivering construction projects. They did however conclude that the study showed that BIM can indeed help project managers in effectively delivering a successful project and that using BIM helps to provide a better picture of reality which makes it easier to understand the consequences that may be faced in project delivery. Rooeki (2015) key findings somewhat align with the findings of Qian (2012) and Lahdou & Zetternan (2011) in that a lack of experience and understanding of BIM is still an issues, however does agree that as a project management tool BIM has significant upside, which is expressed by Rokooei in surmising that ‘ there are similarities between the performance of BIM in the construction process and the project manager as the heart of decision making, therefore BIM can be considered a managerial tool’ Rooeki (2015).

The literature regarding BIM as a project management tool does exist and offers many similar points of view about the benefits which it can have as an effective project management tool in the AEC industry. These studies should be noted however are not specific to the Australian Industry but encapsulate data and information from international sources as well. This research project will allow for more pointed research to focus on the Australian industry; however, the current research does define some clear trends across the subject matter.

2.2.3 Adoption and implementation of BIM within the AEC Industry.

Gu et al. (2008) conducted research into perception of BIM Adoption in the design sector. Cited were several key sources speaking to the adoption of BIM within the AEC industry. Gu et al noted that from a 2003 paper from Johnson and Laepple that a varied market readiness across geographies, and a level of reluctance in changing existing work practices contributed to slow adoption of BIM *(Gu et al. 2008).* Gu et al, cited from contemporary papers from *(Khemlani,2007, Howard and Bjork 2008*) that despite BIMs emergence into the industry collaboration is still based on old methods and that the firm size impacts on the preferred tools *(Gu et al. 2008*). The method used in this study by Gu et al. was FGIs or Focus Group interviews with participation from all sectors of the AEC industry. The main goal of the FGIs to determine the perception of BIM adoption within the industry. The main findings of the

targeted FGIs included the fact that new processes would have to be developed with the introduction of BIM into a work place, organization needing to alter their work practices and significant up skilling would be required to fill jobs that the adoption of BIM would create in a firm ie BIM managers etc.

The research undertaken in the 2008 paper Industry Perception of BIM Adoption in the Design Sector was referenced in a 2010 paper named Understanding and facilitating BIM adoption in the AEC industry by Gu and London (2010) they identify that research has been conducted within the AEC and reference Gu et al. 2008 paper that used focus group interviews (FGIs) are the primary methodology adopted by those conducting the research in this area. Gu and London (2010) paper discusses the understandings on how BIM has been adopted through the FGIs analysis and highlights that two major FGIs have been conducted in Australia, one being Brisbane and the other Sydney, these FGIs covered all major sectors of the AEC industry from architects, engineers, contractors and consultants and a myriad of others. The paper explores the adoption rates of BIM within the AEC industry and its promise within the industry. The reports main findings were that the AEC industry lack of experience in BIM led to what could be characterised as limited understanding of industry needs and technical requirements for BIM (Gu & London, 2010). They (Gu and London) summarise there finding in terms of the product and what expectations are held of BIM products, the process in terms of existing work practices and the changes that would be expected with people regarding the development of new roles and work relationships within the industry pursuant to adopting BIM as a collaborative means of delivering projects (Gu & London, 2010).

In addition to the key Australian studies and papers which have been mentioned above, there is also research which has been undertaken from an international perspective in the same area of adoption across the AEC industry. A paper by Almunster et al. (2017) explores the adoption and implementation of BIM in Saudi Arabian AEC firms. It proposes an alternative methodology to which is presented in Gu and Londons (2010) paper with a qualitative case study as the chosen approach with in-depth analysis of a specific organisation being made, with the cited advantage to this method being the ability to capture detail rich data (Almunster, 2017). Using the PMI project delivery framework, including the ten five processes and ten subject area a BIM implementation framework was developed. The key finding in Almunster et al. (2017) work highlighted that there was lack of awareness in the benefits of implementing BIM by the firm, a lack of training and a competent workforce and the lack of implementation

strategy. It was cited that future research would be beneficial in this area to identify any gaps for continuous improvement.

Btoush and Haron explored understanding BIM adoption in the AEC industry in Jordan. Similar to the studies that undertook FGI analysis in the Brisbane and Sydney markets *(Gu & London,2010).* Btoush and Haron went with a similar methodology in which expert interviews were conducted as their method of gaining expert knowledge. The focus was on using the interviews to assess the current awareness of BIM in Jordan. Survey and interview responses were analysed by the researcher from the viewpoint of a construction company representative where. A questionnaire was initially developed that helped to identify and measure the different levels of BIM awareness and assess the perceptions of the respondent's relative awareness of BIM technology, from this analysis a model of BIM awareness was developed. Btoush and Haron found that professionals in the AEC industry have an awareness of BIM however there is a lack of training and skill in to implement it (*Btoush & Haron, 2017)*

From the research that has been highlighted above the adoption of BIM has faced its challenges with researchers across the globe conducting studies with results, thoughts and conclusions which can be summarised as similar in nature. Whether the Australian industry or not the research suggest that the awareness of BIM is present in the AEC industry, however the skill level, jobs and capabilities to implement it are often lacking in cases of AEC firms and businesses. What isn't clearly discernible is that if these are the only factors which affect adoption and if other factors like economic or financial reasons play a role in this. It is also noted that the studies referenced above span in excess of fifteen years and some of the same issues experienced early in BIMs introduction into the industry are still somewhat of an issue with its adoption in modern times.

2.2.4 BIM Adoption and Policy in Australia

The 2019 Australian and New Zealand BIM report looks into BIM adoption from a policy standpoint, while adoption has been mentioned above in 2.2.3 about some of the factors which impact BIM adoption they do not cover policy. The report states that while there aren't any federally mandated policies in Australia the states have become to develop government-based policy and strategies to encourage the use of BIM. The three key states that the report covers are Queensland, New South Wales and Victoria

Queensland

Queensland government most recent policy coming in July 1st 2019 indicates that the

Queensland government must use BIM on projects valued over $50 million (that have a detailed business case) (NBS, 2019). The report states that the government agencies are now working to use BIM principles in line with their own requirements and needs, some of the states largest construction project have taken up BIM principles. Andrew Curthoys the Director with Queensland DSDIP and chair of the Australasian BIM advisory board wrote of Queensland that the state government is the largest infrastructure client and thus are actively promoting the adoption and uptake of BIM in the construction industry in Queensland whilst helping to drive change within its own agencies and departments as well (NBS,2019)

Victoria

Victoria like Queensland has moved in the direction of implementing policy that recognises the importance of digital engineering in delivering projects. Noted in the paper is that the current operations of the AEC industry is paper based systems and rarely have the level of integration that BIM introduces. Influenced by other regions and nations Victoria is developing an state digital asset strategy in their approach to BIM and it utilisation. The key to the new strategy which is titled the VDAS (Victorian Digital Asset Strategy) is to help ultimately deliver 'cost effective, innovative and value adding assets' (NBS, 2019). The image below shows a visual representation of the VDAS that Victoria has developed.

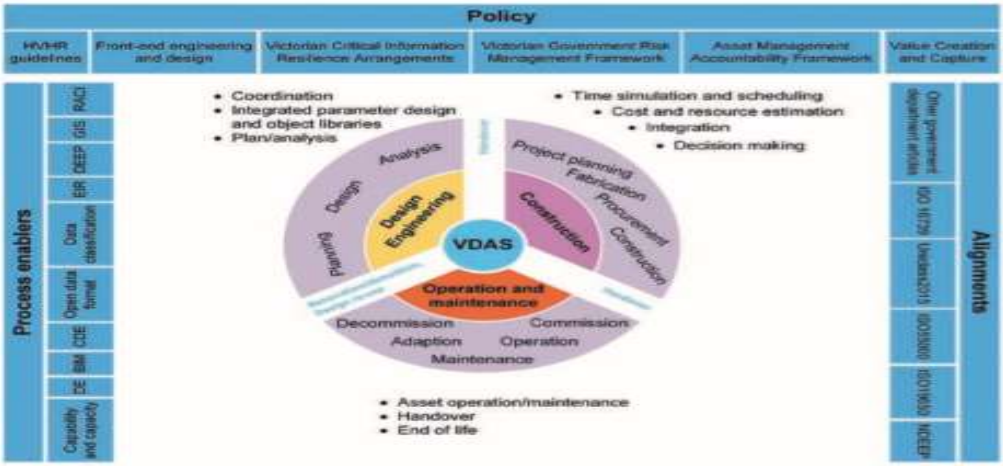

Figure 2-3: Visual representation of the VDAS developed in Victoria (NBS 2019)

The VDAS was launched in 2019 and thus is currently in use in the state today. The way in which is was developed was with professional from industry, academia and key stakeholders, the image below highlights the process

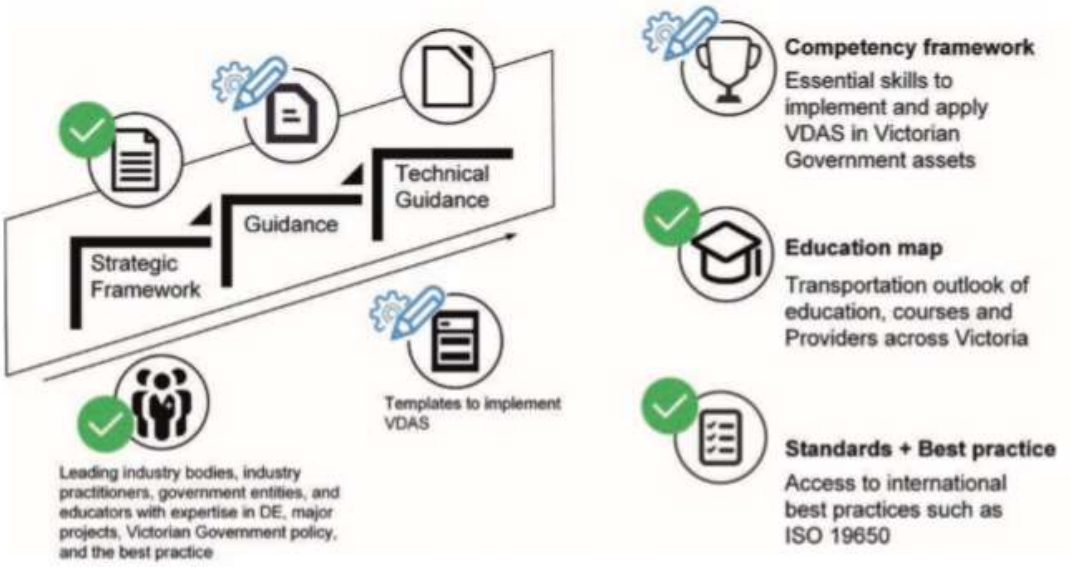

Figure 2-4: Steps taken to develop the VDAS in Victoria, implemented in February 2019 (NBS 2019)

New South Wales

Transport for NSW is the agency which is leading the push for adoption of BIM in their state, by implementing policy. Like Victoria, NSW has developed a digital engineering framework and it is also currently live in the state. Simon Vaux, the Director of didital engineering and infrastructure and place transport for NSW mentioned that they see this as a collaborative way of working, in which digital processes can be used to develop an approach which is more time efficient, easier and more accurate.

Vaux also noted that advances in area like BIM have generally been led by private industry, however in this case it has been in a manner which limits the potential of these digital engineering processes. (NBS 2019). The image below is a visualisation of the digital engineering framework develop in NSW, using global best practices as well as testing on pilot projects the following framework was developed.

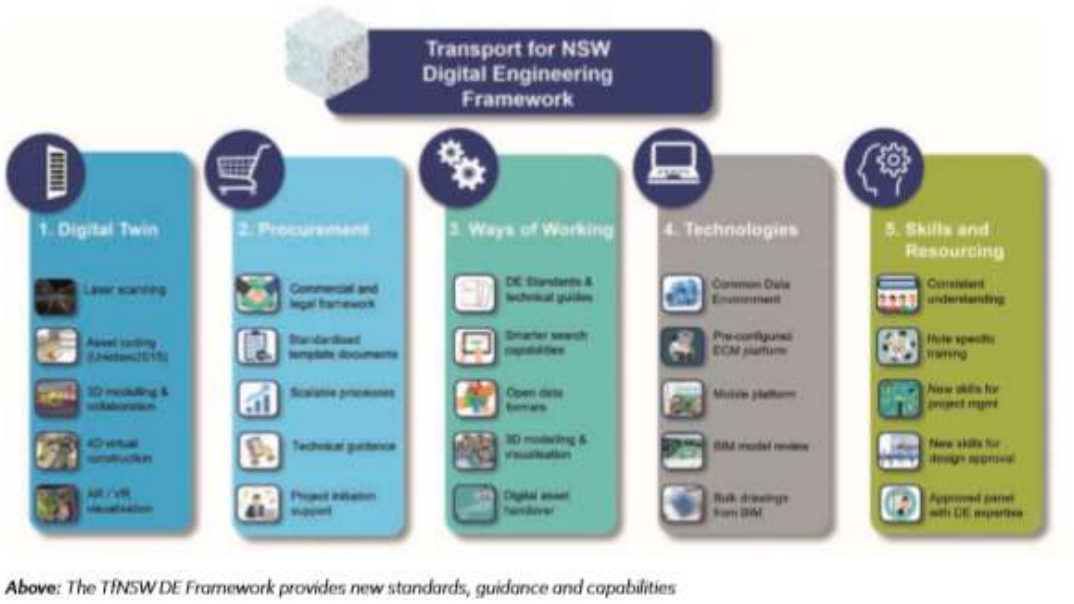

Figure 2-5: Visual representation of the Transport for NSW Digital Engineering Framework (NBS 2019)

While there is a lack of federal policy what this does indicate is that the strides that the states are making in regards to BIM use are significant, and while they may vary slightly from state to state they encourage the adoption of BIM for utilisation in the management of projects around the country. Notably in the past the introduction of such frame works is developed by private industry, in this case however the government is taking the lead in Australian when it comes to adopting BIM practices, processes and software for their benefits.

2.3 BIM case study -

A component of the research includes the looking at a contemporary case study into the utilisation of BIM in Australia. The case study will then be analysed using the methods outlined in 'Chapter 3 - Methodology' with the results being used in the discussion of the findings and analysis of the other data which has been collected for the research.

Case Overview:

The case study analysed for the research was the 1 Bligh Street Project a CBD office high rise located in Sydney.

The large scale project estimated cost is $230 million. The reason for selecting it as a way to analyse the impact of building information modelling practices is because it is one of the first commercial projects in Australia which implemented multidisciplinary BIM collaboration processes and procedures.

BIM Role in the Project:

BIM played a significant role in the project from documentation, through to construction. The use of BIM was mandated by the client and was expressly included in the contract. The plan is that the client will use the model for facilities and asset management purposes as well.

Case Study Participants:

The following is a key breakdown of those that participated in the project. One of the key reasons for selecting this project was the fact that it included a number of key stakeholders from design through to constructions. Also a broad range of the key staff were asked for their input giving an insight into how the project performed.

Consultant	Interviewees
Architects **Architectus**[1]	Design Technology Director
	Design Director
	Project Architect
	Modeller
Structural Engineers **Enstruct**[2]	Director
	BIM Manager
Services Engineers **Arup**[3]	Director
	Modeller
	BIM Manager
Contractor **Grocon**[4]	Design Manager

Figure 2-6: Breakdown of key stakeholder for the 1 Bligh Street Project (CRC Construction Innovation)

Chapter 3 – Methodology

A significant component of the project is to gain an understanding on the adoption of BIM and its effectiveness as a management tool in the Australian AEC industry. The way in which the data has been collected to ensure that the objectives and aims of the research are able to be closely analysed are important to understand and highlight. As such analysis of the data collected by the different methods will be closely undertaken to ensure the project objectives and research aims are met. This section of the report will go into the key steps, methods, ideas and processes undertaken to gather the data which has driven the outcomes and results of this research and the subsequent analysis of these results which are covered further on in the report. These steps were followed to ensure that credible data has been gathered and that the way in which it is analysed ensures that evidence can be used in assessing the requirements of the research. A range of data was collected using a mixture of methods and sources in order to be able provide quality research. It should be noted that due to the current pandemic situation original methods planning to be used were either abandoned, altered or had a bearing on how the research could be conducted. The following section of the report outlines the details of all these scenarios below.

3.1 Required Resources

The table below outlines the variety of resources that are required to undertake the project and allow for credible analysis and results to be undertaken in order to meet the objectives and aims of the topic covered as a part of this research.

The nature of the research means that most research will be desktop-based studies only and doesn't require the use of physical tools, access to labs or any specialised equipment in general. The table below outlines the resources required for this project, which are broadly categorised into the following

1. Human Resources
2. Software Resources

The table below breakdowns the required resources for the project.

Table 3-1: Project Resources required for project

Resource Type	Duration	Cost	Additional Comments
Industry professional for survey/interview on BIM in the Australian AEC industry	4 – 6 weeks	Travel costs if required by researcher/student	A select group of industry professionals will be selected to take part in surveys/interviews regarding the research topic.
Academic supervision	Full Duration (approx. 20 weeks)	Free	Supervisor will be utilized as a resource to provide balance, advice and guidance throughout the undertakings of the research.
Microsoft Office	Full Duration (approx. 20 weeks)	Free	Microsoft office will be used to execute the final
Microsoft Excel	10 weeks	Free	Excel will be used extensively in areas of research, model development, testing and trailing. It will also be used for collation of results and data for the purpose of produces graphical representations used for compiling the dissertation.
USQ Survey Tool	10 weeks	Free	Survey tool is used to develop and distribute surveys and questionnaires

3.2 Research Methods

The data collected for this research was developed in a way in which three key methods were utilised;

- Survey
- Questionnaire
- Case Study

A mixed approach of collecting data was adopted to undertake this research, which included the collection of both qualitative and quantitative in nature. The purpose of the mixed method approach is to aid in strengthening the conclusions which can be derived from research against the objectives of the project.

- The survey was predominately used to collect quantitative data with a small percentage of open-ended question to collect qualitative data
- The interview/questionnaire was the inverse in terms of proportion of questions included for the purpose of collecting qualitative and quantitative data in which the more open ended (qualitative) questions were much higher than in the survey
- The case study being to find an existing case study in Australia in which BIM was utilised to manage the project throughout the project lifecycle from design to

3.3 Research Targets

3.3.1 Survey and Questionnaire Companies

The following highlights the list of research targets which had the survey and questionnaire distributed to them in order to participate in the collection of data.

The companies comprised of and fell into the following major categories

- Engineering consultancies
- Architecture Firms
- Construction Companies
- BIM Consultancies

The companies were pulled from a number of different sources including industry knowledge, a search of top Australian consultancies and contractors as well. The distribution of invitation was sent to as many companies as possible to ensure that they had the chance to participate in this research.

In distribution emails the companies were asked to distribute the link to surveys to their broader employee base and even to other offices within the company.

The breakdown of distribution included

- Engineering Consultancy (8 companies)
- Construction Companies (10 companies)
- BIM Consultants (6 companies)
- Architecture Firms (6 companies)

The numbers above indicate the amount of companies to which emails were sent inviting participation; however it should be noted that individuals from each company were also directly contacted where there contact details were assessible and also different branches nation wide of each of the companies was also contacted.

3.3.2 Survey and Questionnaire Job Description

To ensure that a diverse range of opinions were heard by those in the industry the job descriptions of those targeted was to be broad to capture this diversity in opinion. The following list is an example of (and not limited too) the types of industry roles which were targeted in the distribution to the different company types listed above

- Project Managers
- Project Coordinators
- Projects Administrators
- Construction Managers
- Site Managers
- Portfolio/Program Leaders
- Engineers (of varying disciplines)
- Designers (of various disciplines)

3.4 Survey Sample Size

To understand the sample size for the survey, it was calculator using the following parameters

Confidence Level – 90%

Population – 263,890 *(Engineers Australia)* – this population came from the population census of 2011 conducted by the Australian Bureau of Statistics. Because it is difficult to understand the full population of the Australian construction, architecture and engineering industry this number was used to have a basis for the population for which a large majority of the people come. Because of the large number of workers active and employed in engineering who cover multiple disciplines and job description it covers a lot of the people who participated in the survey. The size of the population means that the ideal sample size won't change. Trial and error was done here to see the impact of population size which remained unchanged at several larger values, 500,000 and 1,000,000 were the numbers trialled.

Margin of Error – 10%

A sample size calculator was used to find the ideal number of participants based on the numbers above, see the image below.

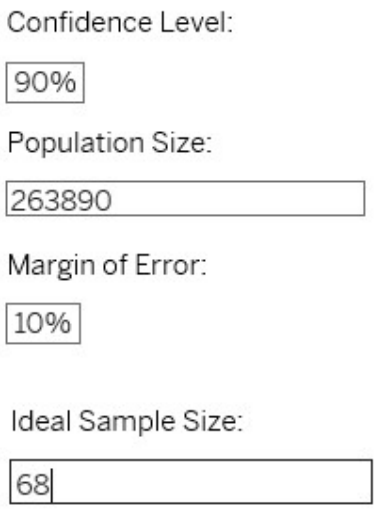

Figure 3-1: Sample size calculator used to determine ideal sample size for survey

As can be seen above the sample size of the survey based on the numbers provided means that sixty-eight (68) participants would be required in order to have a sample size which meets the requirements of the population. Unfortunately, despite distribution to a number significantly larger than the sample size the amount of responses collected was totalled at 20 participants.

The one disadvantage of a having a small sample size is that there might be a disproportionate number of participants who are outliers and this may skew results (Qualtrics, 2020).

Despite the data from the server has still be collected and the results analysed and discuss to determine any trends that may be key for the research findings.

3.5 Questionnaire Sample Size

The sample size for the questionnaire was more restricted than that of the survey. While the survey was used to explore a much broader cross section of the AEC community in Australia the questionnaire was more about finding participants that were willing to answer some more open ended and broad questions based on their experiences. I was looking for six (6) different participants in order to gain a diversity of thought for the questions asked. After asking a significant number of companies and firms if they would like to be a part of the research and out of that group I managed to get six to commit to taking the questionnaire

Of the participants they were broken down as follows

- 2 x participants from Architecture Firms
- 2 x Engineering Consultancies
- 1 x BIM Consultancy
- 1 x Government Department Employee

As well as the different companies they came from they also had different role

- 1 x Interior Designer
- 1 x Architect
- 1 x Bim Consultancy Owner/Manager
- 1 x Digital Model Manager
- 1 x Project/Construction Manager
- 1 x Senior Civil Designer

Though a small sample group the diversity of occupation and work place was deemed to be sufficient when talking to these particualrs participants, unlike the survey where varying levels of BIM experience completed the survey those that did the questionnaire were those that used BIM frequently and understood it functions, capabilities and potential already.

3.6 Survey Research Ethics

The human participation element of research meant that a USQ ethics application was required to be submitted and approved prior to the commencement of any data collecting activities. The risk associated with this research was deemed to be low risk.

Participants were notified that the survey had been subjected to ethics approval when the survey and questionnaire/interview questions were originally distributed. Distribution also included a copy of a project information sheet in which outlined the key project data and also was a copy of an USQ ethics form.

It was made known to the participants that if they were submitting a survey, that this submission would serve as their consent to participate in the process.

The Human ethics was submitted to and approved by the USQ Human Ethics committee in which the approval reference was H20REA223.

3.7 Validity of Results

Data collected was also de-identified and this was made clear to the participant as well that their name and other identifying data would not specifically be included in the results and analysis of these results as a part of the project. The purpose for de-identifying the data was to ensure that participants felt comfortable in being honest and thus providing data that was not influenced by the thought of repercussions or outside consideration. Capturing the exact thoughts and data supplied by the participants using the USQ Tool meant that there were no errors that might be found in other methods of data recording like transcription of answers given by participants. This allowed for valid data to be collected for the purpose of the results analysis.

3.8 Data Collection

3.8.1 Survey

As mentioned previously the survey was one of the methods used to collect data for the purpose of this research. The intention being that it was a way of being able to collect a relatively large amount of quantitative (and a small percentage of qualitative data as well) data. The questions where asked as a mixture with questions that often had a follow up element were asked with a quantitative question first, then followed a qualitative question secondly often to explain the previous answer given. The reason for this was so that often the participant could justify what

answer they had given to a previous question which helps to analyse the position that the respondent holds on the subject.

The survey questions were developed in a way which aligned with the objectives of the project to ensure that the data collected was able to be used to draw conclusion, trends and ideas in relation to the research aims of the project and was also set up so a broad range of participants from varying companies and occupations could be included in the research. The USQ survey tool was utilised to store and collect the results of the survey, the survey questions were put forward and then the survey activated which provided a link that could be used for distribution to the parties highlighted above in the research targets section of the methodology. As mentioned in the sample size section of the methodology 20 participants responded.

The questions were made to be concise and straightforward for the participant to easily be able to complete the survey without questions regarding the context of the question or topic. In total 15 questions were included in the survey

The key topics of the questions were

- Question pertaining to diversity of participant, age, company worked for, job title
- Questions about BIM awareness
- Question about BIM utilisation
- Questions about BIM adoption
- Questions about BIM effectiveness

The list below outlines the list of questions in which

Table 3-2: Survey Questions

Number	Questions
1	What is your age range?
2	What company do you work for?
3	What classification does your company fall under?
4	What classification does your company fall under? [Other]
5	What is your current job title? Please explain your role in 50 words or less.
6	Do you know what Building Information Modelling is?

	In your own words (100 words or less) please generally describe what you understand about the function, processes and capabilities of BIM (Building Information Modelling) and its application. If you do not know, please indicate by including the following 'I do not understand the understand the functions, processes and capabilities of BIM.'
7	Do you use BIM processes and/or practices in your position on a daily basis?
8	If you answered 'YES' to Question 7 please explain the capacity in which you use BIM (Building Information Modelling) and for what purpose (project documentation, design managment, construction management, tender documentation etc). If you answered 'NO' to Question 7 please answer with the following statement 'I do not use BIM practices in my daily work'
9	If you don't use or haven't adopted BIM (building information modelling) in your daily role do you know somebody within (or outside) your company/firm who does use it.
10	Do you know if your company uses BIM (Building Information Modelling) for project work?
11	Do you work in a department of your workplace that has adopted BIM processes and practices within the following time frames?
12	Based on your knowledge of BIM practices, processes and capabilities do you think BIM can be an effective in managing construction projects (whole life cycle: concept through delivery) tool?
13	Would you be open to training as part of your role within industry to help you gain a better understanding of how BIM (Building Information Modelling) processes and practices could be utilised in your role?
14	Would you consider BIM technology being more advantageous (than disadvantageous) to the effective management of construction projects? This may be based on your practical experience or even your theoretical knowledge of BIM.
15	Based on your position within the industry which of the following options would you consider the most likely reason for your employer not adopting BIM technologies and practices more readily?

Prior to participating in the survey, the participants were provided with an information sheet which outlined the purpose of the research and any pertinent details to taking part, including who they could contact if they had further questions. In addition to the information sheet a consent form was also included, it was noted to the participants that completing and submitting the survey was considered consent of use of results in the research.

Before the participant enter the survey they also read a welcoming message to outline the duration of the survey and again stating the purpose for collecting the data

Once the survey had been completed by participants, a submit button was hit. The results of the survey were automatically stored in the USQ survey system and were able to then be exported in a number of different formats as raw data for the purpose of analysing the data that had been collected.

3.8.2 Questionnaire

The way in which the questionnaire was developed shares a lot of similarities with the survey. The key difference being that the intention of the questionnaire was to ask more opened ended questions in the pursuit of collecting quality qualitative data (and a small portion of quantitative data) in order to complete an analysis. Again, like the survey the questions were a mixture with some questions used as a way for following up previously asked question in order to be able to justify the answers given by the participant clearly. What this does is help to find any anomalies that might be in the response of the participant and to develop key trends of thought and conclusive evidence of suspected findings.

The questionnaire questions, like the survey developed in such a way that the project objectives were covered off to ensure the responses given by the participant could be used to carefully analyse the projects aims and objectives. The USQ survey tool was also used to develop the questionnaire and store the data for easy extraction. The questionnaire was activated and a link generated so it could be sent to the participants.

One of the key differences between the questionnaire and survey is the fact that the participants of the questionnaire were limited to those that had significant exposure to BIM as a part of their workplace or daily work routine. The reasons being that to go along with the data collected from 20 people from the survey that a more in-depth look at BIM in align with the project objectives was required, therefore six (6) people were selected to undertake the questionnaire, refer to Sample size section of the methodology for the details.

The USQ survey tool was again utilised to store and collect the results of the survey, the questionnaire questions were put forward and then saved and activated which provided a link that could be used for distribution to the parties highlighted above in the research targets section of the methodology.

The questions were made to be concise and provide sufficient amount of context, whilst still leaving enough room for the participants to provide quality responses about the questions asked. In total 15 questions were included in the survey

The key topics of the questions were

- Question pertaining to diversity of participant, age, company worked for, job title
- Questions about BIM awareness
- Question about BIM utilisation
- Questions about BIM adoption
- Questions about BIM effectiveness
- Questions about BIM Training

The list below outlines the list of questions in which were developed for the questionnaire.

Table 3-3: Questionnaire Questions

Number	Questions
1	What is your age range?
2	What company do you work for?
3	What classification does your company fall under?
4	What is your current job title? Please explain your role in 50 words or less.
5	Do you think that overall BIM is used effectively as a construction management tool in the Australian Industry?
6	Do you think that in the Australian construction industry that BIM is utilised to its full potential? Whether you answered YES or NO please explain your reasoning below (approx. 50 - 100 words)
7	What internal or external business factors (ie cost, lack of training, non skilled workforce, client reluctance) do you think would contribute in stopping a company or firm from adopting BIM technologies and practices? Please answer below.
8	In your company are BIM practices/processes used for all aspects of construction projects, from design through to construction. If not please explain below which aspects for which BIM practices are used in your company/firm.
9	Do you think overall BIM is an effective tool in the management of construction projects in Australia? Yes or No, please explain your answer below.
10	Within construction (and engineering/archtiecture) do you think there a reluctance to adopt BIM practices in the Australian industry? Yes or No, Please explain your reasoning below.
11	In general regarding BIM do you think the Australian construction industry is behind other industrialized countries in terms of our BIM related skills and training? Yes or No, please explain your reasoning below.
12	What would you consider the main advantages (and disadvantages) of using BIM for the management of projects? Please highlight adavantages and disadvantages below.

13	In your view does the country have enough skilled workers in this area to adequately train those that are new to BIM practices moving into the future? Please explain below.
14	Do you think BIM has any impact on the contractual relationship between parties in the Australian construction/engineering and architecture industry? Yes or No please explain your reasoning below.

Prior to participating in the questionnaire like with the survey, the participants were provided with an information sheet which outlined the purpose of the research and any pertinent details to taking part, including who they could contact if they had further questions. In addition to the information sheet a consent form was also included, it was noted to the participants that completing and submitting the questionnaire was considered consent of use of results in the research.

Once completed by participants, a submit button was hit. The results of the questionnaire were automatically stored in the USQ survey system and were able to then be exported in a number of different formats as raw data for the purpose of analysing the data that had been collected.

3.8.3 Case Study

The purpose of analysis of an existing case study was to understand the real life application of BIM on a project and how it is used in the overall management of a project.

The case study, which is detailed in section XX of the report was chosen because of high level of information it provided about the specifics of the project.

One of the keys of selecting a suitable case study to investigate and analyse for the purpose of the research was to understand how BIM use impacted on the management and delivery of a project. The purpose of the using the Bligh Street study was helping to understand BIM use in real life scenarios and where the advantages and disadvantages were found throughout.

To analyse the key findings of the case study four (4) broad questions were proposed in order to help identify any key trends regarding the BIM use on projects and the projects objectives.

Table 3-4: Case Study Criteria

Number	Questions
1	Was there an element of training involved in taking on the BIM practices for this projects?
2	Disadvantages/Problems of using BIM on this project.
3	Advantages/Benefits of using BIM on this project.
4	Was it an effective way to manage the project?

Selecting the case study was a matter of ensuring that the information provided was enough to develop context so that the questions in Table 3-4 above were able to be comprehensively answered in a way which added credibility to both the survey and questionnaire data collected.

3.9 Data Analysis

The collection of quantitative data from both the survey and the questionnaire were all exported from the USQ Survey Tool into an excel spreadsheet. From here the data was formed into different forms of charts and tables to ensure the results could be displayed visually.

The visuals aids developed were the used to understand and develop trends and find information that was related to the key project research aims and objectives. These being understanding BIM utilisation, the advantages and disadvantages of BIM, the effective of BIM as a management tool and adoption of BIM in Australia.

Using the same project and research objectives mentioned above the qualitative data provided by the participants was interpreted individually against the question's askes with key trends and patterns identified to understand the differences and similarities found in the response from each o the participants. Because only six (6) people participated in the Questionnaire the data from here was able to be directly compared with the responses from the other participants with key phrasing and patterns identified in the results and discussions section of the report, in the aid of identifying key project conclusions.

One of the other ideas for the analysis was to get an understanding of any similarities found between the three different data collection methods (Survey, Questionnaire, Case Study).

3.10 Challenges in Conducting Research

The extended duration of the research period meant that a number of challenges were experienced in the collection of data phases. This often meant that small changes needed to be made to ensure that the project could continue unimpeded.

One of the most difficult challenges was the participation of industry professionals for both the survey and interview/questionnaire. Despite distribution a large number of potential participants from lots of different companies' either responded by saying they would pass the information onto their workplace/employee (and never appeared to do so) or they would say that they would not be participating in the

As explained earlier in this section of the report this was one of the key drivers behind having the different data collection methods at my disposal was to ensure a data sample that was able to be collectively used to study the research topic if there was a lack of participation in some areas.

The other key issues was the Covid-19 pandemic, with a lot of people not in the familiarity of their workplace and trying to prioritise the new balance in working from home, taking care of children and increased workloads in some cases meant that this was often something that was cited as a distraction to not being able to participate in the survey in particular. As mentioned earlier an interview/questionnaire was also developed, initially the plan being that the interviews would be done face to face were possible, however this became difficult and thus different methods, including video calling and answers provided by way of submission of online forms took precedence over the any face to face contact that was planned.

The Covid-19 restriction did not only have an impact on the participants as a whole but also myself as the principal investigator on this project, restriction mean working from home and subsequently in some instances an increased workload meant restrictions to being able to complete research tasks in line with the plan to develop the research. A tightly scheduled plan was required to ensure the research

Chapter 4 – Results and Discussion

4.1 Results Analysis and Discussion

The following section of the report covers the analysis of the results obtained through the research and data collected for this project. Using the methodologies described in section 11 of the report, data has been collated and the trends and numbers have been cross analysed in order to discover useful information which has been discovered from the data collected in the Australian engineering, architecture and construction industry in Australia and which have become evident as a result of the research.

This section of the report presents the results from each of the methods of data collection (survey, interview/questionnaire and case study) and will discuss the trends, ideas and conclusions that can be reached based on the research.

4.2 Survey – Results and Discussion

The following is an analysis and discussion of the data collected via the industry survey. It allows for the data that has been collected to be analysed against the aims and objectives of this research in order to find key pieces of information and a more conclusive understanding of the research topic.

As per the methodology in section 11 of the report the survey consisted of fifteen (15) different questions, each of which were constructed to help gain a deeper understanding of building information modelling in the Australian industry. The survey had been developed so credible quotative data could be collected. This portion of the research allowed for direct analysis of the numbers based on the data provided by survey participants.

While the survey was predominately used for quantitative research there were questions that allowed for the insight from a qualitative perspective.

Below is a cross analysis of the results from the numbers and data taken from the survey and discussion around what the data means in the context of the research and other literature which is available pertinent to the topics discussed in this report.

4.2.1 Survey – Participant Diversity

As per the methodology several different business models and types were targeted for participation in the survey, the justification being that inclusion of diverse range of thoughts and opinions would help develop credible research and understanding of the research aims and objectives.

To understand the level of diversity of thought that had been captured, a question included in the survey explicitly asked for participants about what category the business or firm they worked for fell under. Four major options which included the three key business that manage and deal with construction projects in Australia were targeted, with an 'other' option being available for those that didn't fit into the specified categories. Categories included:

- Engineering Consultancies
- Architecture Firm
- Construction Company (Specify Tier)
- Other, (e.g. State Government Agency)

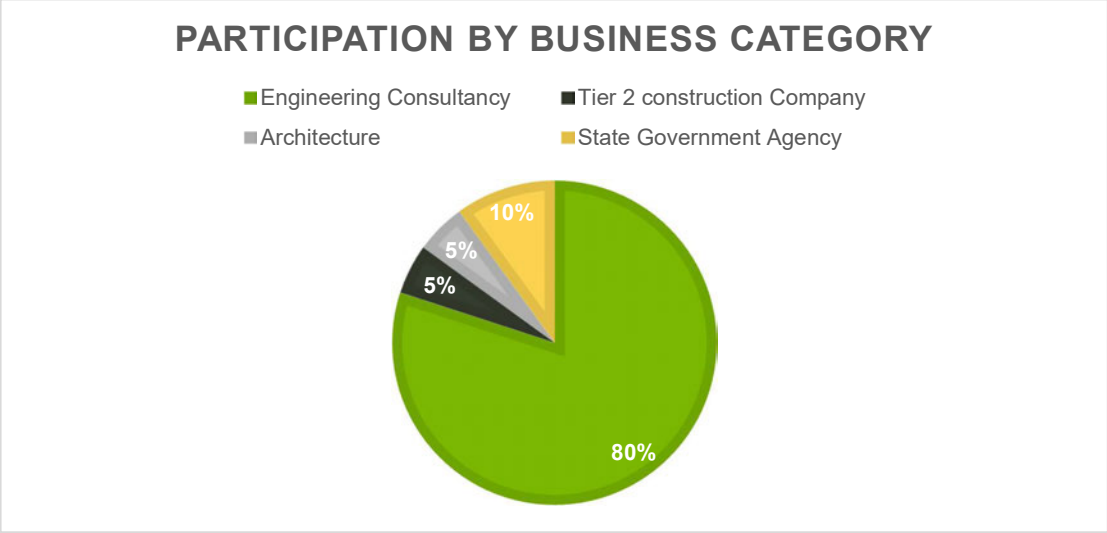

Figure 4-1: Survey participation by business categorisation

Analysis of the data above regarding the types of company's participants work for, seen in Figure 4-1 above, highlights the percentage of participants from different types of businesses and organisations. This graphical representation indicates an overwhelmingly strong participation in the engineering consultancy space, with participation at 80% from this group, the others fall into being 10% or less of the participant group. While these businesses made up

the primary sources to which the survey was distributed, the return rate compared to the send rate on construction companies, architecture firms, and those considered 'others' were not as strong, this is despite the fact that distribution percentages between them being relatively equal, with engineering consultancies being – (39%), architecture firms being (10%), construction companies being 45% others being (6%). No obvious reason in which engineering consultancies where returned at a much higher rate has been determined, with the same questions, time parameters and project information being supplied to all companies and firms. The one key piece of information which likely explains the phenomenon however is that the consultancy businesses in most cases have a larger employee base in which the survey was able to be distributed and data collected from.

While there were only four different business types engaged a broad range of job titles were targeted in the research, when Figure 4-1 is read in conjunction with Figure 4-2 below it highlights it identifies that participants fell into 8 distinct categories, listed below

- Project Manager
- Site Engineer
- Civil Designers
- Structural Engineers
- Archtectural Technicians
- Civil Engineers
- Digital Specialist/BIM Managers
- Program and Portfolio Leaders

It should be noted that distinction wasn't made between different levels of experience within the different job titles, this was because as all participants were at levels higher than that of a graduate.

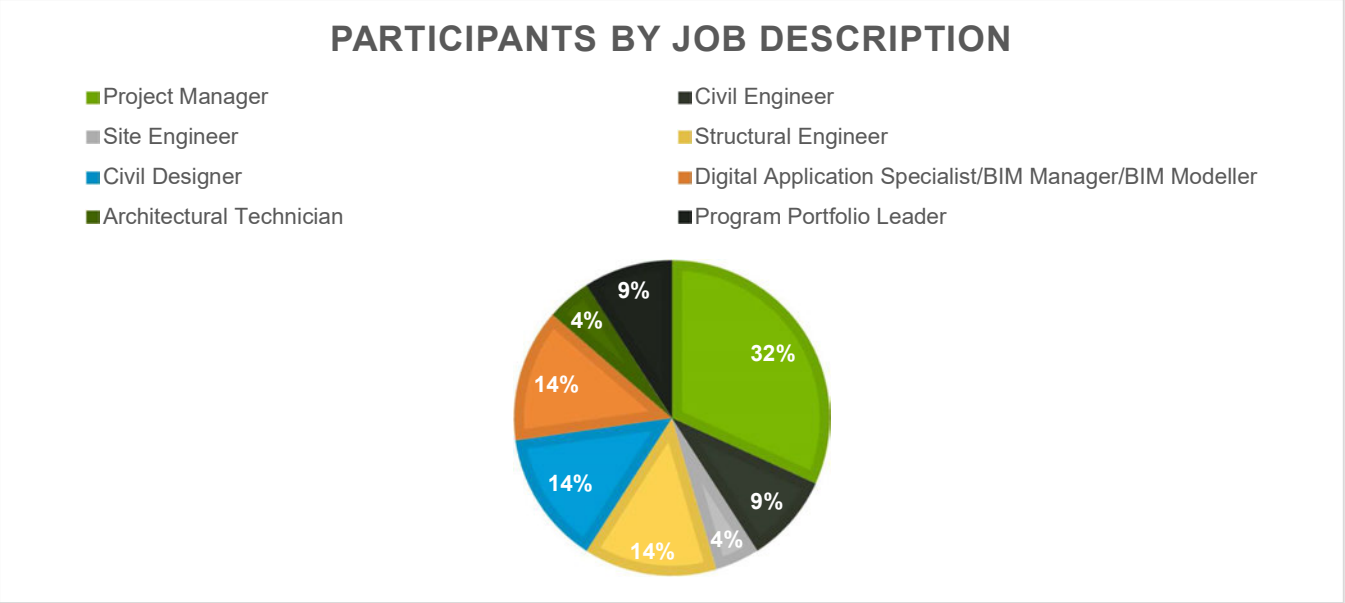

Figure 4-2: Survey participation by job description

The data indicates that though engineering consultancy participation was high, businesses under the engineering consultancy banner had the largest array of jobs for which participants were working in. They often have a varied range of jobs and position due to their structure and large reach within the industry. As highlighted in the research methodology the diversity of roles and job titles means that a broader understanding of how aware these workers are of BIM and how it is utilised in the business will be understood. The idea of the method for data collection was to get a view that was diverse and had varying understanding of BIM and the capabilities of its processes and practices. Based on the information provided by the participants, there was a suitable level of diverse opinion captured in the survey from a job title perspective.

As a part of the research it was also important that those participating were of varying levels of experience and age to ensure that not just one group of people were represented in the data. While age doesn't necessarily equate to experience regarding a particular area of expertise it does indicate the experience that an employee may have. Understanding this premises now a more intelligent question to ask as opposed to the age of the participants is the current level of experience they have in the industry or their job. Figure indicates that while there was a broad range of age groups the 25-35 range was the most popular to being 65% of the participants, 15% being from 35-45 and 20% being in the 45+ range, overall, all that participated were over

25 years of age. While this is not always an indicator of experience it does mean that those that did participate do have perceived level of experience that you wouldn't expect a newcomer (ie graduate) would have coming into the field about the practicality of BIM in the works place.

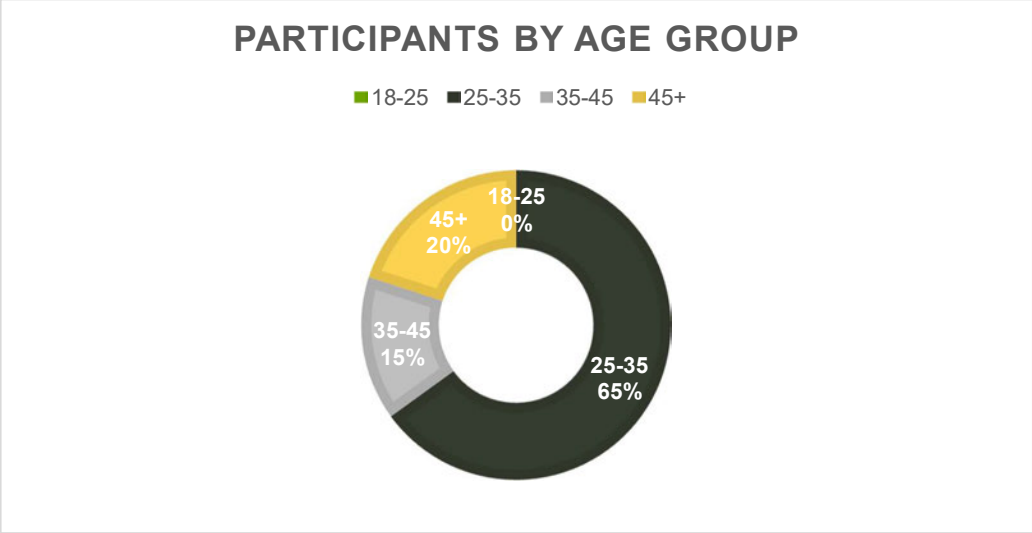

Figure 4-3: Participants by age group

While these first three metrics data sets including company, job title and age don't specifically provide any information regarding BIM and its effectiveness in managing projects or understanding adoption rates in the industry, it has provided a basis for the remaining data that was collected as part of the survey. It indicates that the data doesn't come from a homogenous group that came from a single source and were in jobs within the industry. Not being able to simply categorised where participants work, their occupation or age, underlines the level of diversity that was expected when undertaking this research and implementing the methodology outlined in Chapter 3.

4.2.2 Survey – BIM Awareness

While having an overall understanding of those that have participated is important, the surveys purpose was the pursuit of data pertinent to building information modelling (BIM) in the Australian industry. Understanding the level of engagement and knowledge the participants have with building information modelling practices/process, whether this is from a practical sense in which they used BIM in their jobs or even theoretical understanding of what BIM entails. Figure 4-4 below indicates that when the asked whether or not the participant had an understanding of BIM and what it functions/capabilities are that 95% of participants had some level of understand by way of either of the following responses, yes, I

have a full understanding of what it is or I somewhat know what BIM is. Breaking it down even further 55% responded with the 'yes' option and 40% responded with the 'somewhat option available and finally only 5% of those that participates said 'No, I don't know what it is'.

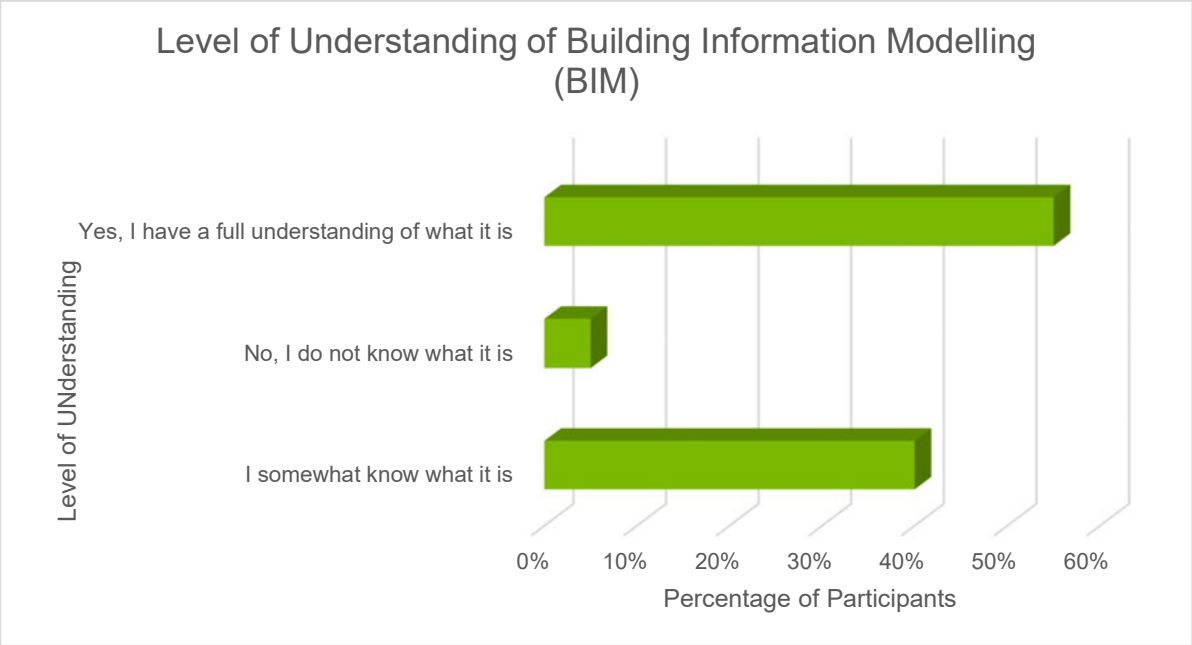

Figure 4-4: Level of understanding Building Information Modelling (BIM)

These numbers alone does give an indication that a level of awareness amongst different employees, that work in different environments and roles understand and recognise the existence of BIM. What this does is highlight that despite the fact that people may not utilise it in their day to day work that they have been exposed to BIM in some way in which they are comfortable enough in being able give data indicating they know what BIM is, this also indicates that BIM has likely been adopted across these different businesses. This aligns it self with the first objective of project in understanding how BIM is utilised in the management of projects in Australia, without outstanding whether or not participants even know what BIM is it would be difficult to be able to take the data they supply and have confidence that they understand whether or not BIM would be effective in the management of construction projects.

While figure 4-4 above has a generalised overview of the participants response to their understanding of BIM a break down of the response by job title has been developed also. Figure 4-5 below breaks down the same responses that were mentioned earlier but separates them via the job title. A key trend when the data is broken down to this level is that job titles which

typically would include an element of design are those that responded with the fact, they had atleast somewhat of a level of understanding on what BIM is. This could be down to the fact that these jobs, including

- Civil Engineer
- Structural Engineer
- Civil Designer
- Digital Modeller/BIM Manager
- Architectural Technician

have been or are somewhat exposed to the concept of BIM through being immersed in their work environments, training undertaken, colleagues utilising BIM practices as a part of their work requirements and routines. Countering this is the fact that those who responded saying they didn't understand BIM at all, though only a small portion of the sample at 5% saying this was so,

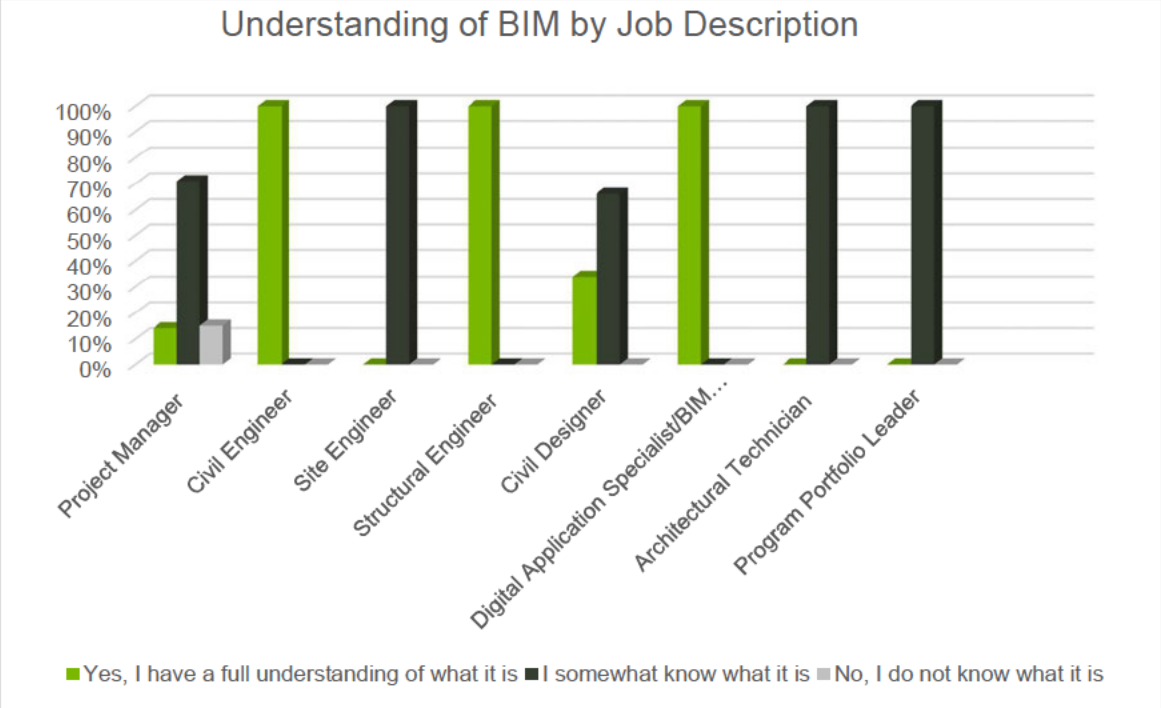

Figure 4-5: Level of understanding Building Information Modelling (BIM) broken down by job description

While the rate of those that said they had a full understanding of BIM was 55% as can be seen in figure 4-4 and the 40% said 'they somewhat knew' what it was the participants were also asked whether or not they use BIM practice as a part of their day to day work routines and duties. The figure below indicates that despite over 90% of people saying they understood BIM to atleast some degree (see figure 4-4) only 30% of those that participated used BIM in the day to day of their job.

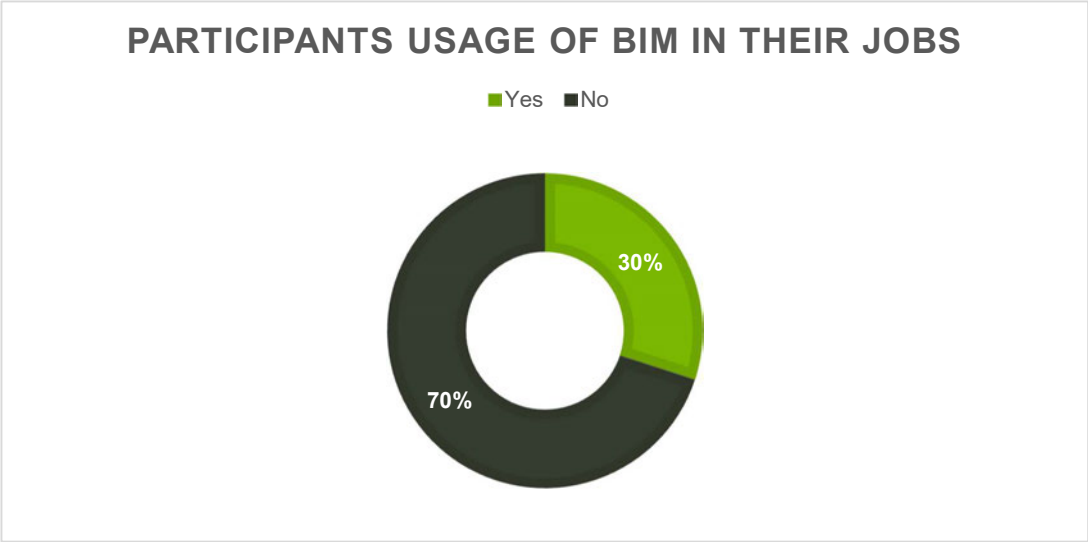

Figure 4-6: Participants usage of BIM in their day to day jobs

What this data indicates is that despite not using BIM practices explicitly as a part of their jobs there is a level of understanding that those in the industry seem to obtain, whether this is through further study in their careers or being in an environment where the discussion around topics like BIM are frequently had by virtue of being ingrained in the industry. To ensure that a more conclusive understanding of BIM and what its functions and capabilities are participants were asked to offer a considered written response to an open ended question in which they were to explain in their own words there level of understanding of BIM function and capabilities. The question was included to provide data that aligns specifically with one of the key objectives of the research. That objective being understanding how BIM is utilised in the management of projects in Australia.

The response to the open-ended question regarding BIM returned results that largely varied regarding the type of language used in the self-explanations from the participants. Responses indicated many similar patterns of recognition and thoughts about BIM and its function in a way which relates to the management of projects. The key trends discovered through responses included

- The mention of integrative/3D model that could be used to aid in capturing design from disciplines in order to aid in the design and management of projects from concept through to construction. Models being a single source of information
- The mention of use for purposes like clash detection in construction phases
- Reference that models can be used through project lifecycle from planning and design through to construction to aid in the management of projects
- Integrated platforms for end to end (project life cycle) planning and execution of projects.
- 15% of respondents directly or indirectly mentioned software with the ability to be used to build integrative models that could be multi-disciplinary in nature

The main points highlighted above are collection of thoughts from the participant group, however very few respondents had comprehensive explanation regarding BIM, many only spoke to the third or fourth dimensions of building information modelling despite the fact that it also has a fifth, sixth and seventh dimension – which is outlined in Chapter 2 – Literature review in section 2.2.1, in which all of the dimensions are explained. This trend is likely to be the level of exposure the participants have as all companies don't use all the key dimension of BIM.

Of the respondents, those considered to have answered satisfactorily on what they understood about BIM practices based on information that can be found in Chapter 2 – Literature review of the report are at 60%, with 25% having answers that were deemed somewhat satisfactory and captured the essence BIM. The remaining 15% of respondents provided answers which indicated that there understanding was either non-existent or limited relative to other responses given as well combined with what we already know about BIM.

Comparing these number to how participants previously answered in relation to Figure 4-4 , where 55% provided answers saying they understood what BIM was, comparatively when asked to explain BIM around 60% of responses were deemed satisfactory. The close nature of the statistics indicates that those that said they understand really do have an idea about BIM and are not unsure about what it representation in term of it's utilisation in the industry.

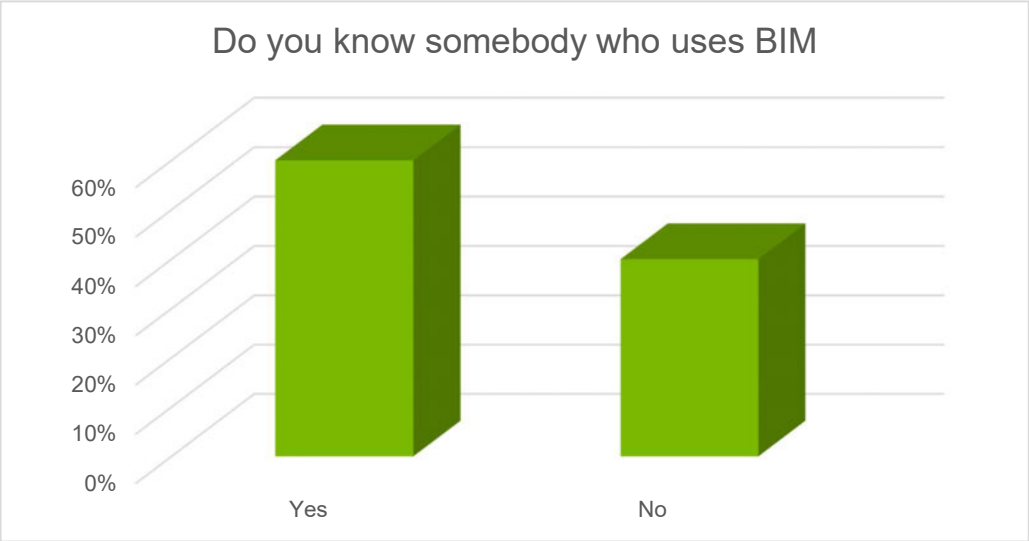

Figure 4-7: Does the participant know somebody that uses BIM as a part of their day to day work

A focus of the survey was to understand how BIM has been adopted in the industry. To gauge the level of engagement with BIM in the industry it was asked of the participants if they knew somebody within or outside of their own companies of those that utilised building information modelling practices and processes as a part of their everyday work. Figure 4-7 above indicates the data collected showed that over half (55%) of those participating knew somebody who used BIM in their work. What this data tends to indicate that is despite maybe not being a BIM user themselves or having a full depth of understanding is that workers do understand that BIM is used within the industry and that they are aware of others that use it as apart of their daily work. To understand that others use this in their work in the industry helps to solidify the fact that BIM has been adopted as a way of managing projects.

A key objectives of the research is to understand the adoption of BIM in the industry, to know whether or it is actually being used in architecture firms, engineering businesses and by contractors to manage projects in a way in which BIM processes are practiced and are productive in managing projects. Of the participants who took the survey 85% of them said that 'yes' there company or workplace uses BIM specifically to manage project related works, with 10% being unsure and only 5% saying that there company does not (refer to figure 4-8 below).

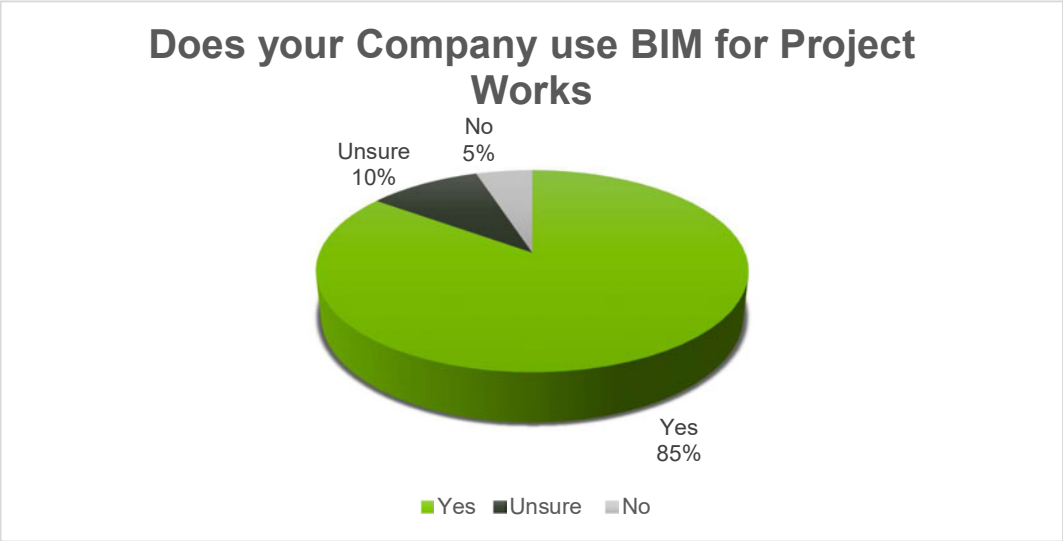

Figure 4-8: Participants usage of BIM in their day to day jobs

It appears to be evident as participants continued to answer these questions that despite not all being users of BIM practices and processes that the level of understanding amongst those that participated is 'significant' in that their level of knowledge is evident in answering questions about BIMs capabilities, functions and purposes and utilisation in the industry.

The data highlights that the types of companies (engineering consultancies, architecture firms, construction companies and others) that the studies participants work for have introduced BIM practices and processes into these working environments to be utilised on project specific works. What this indicates is these businesses have either begun the process of adopting BIM or having been using it for some time. Follow up questions to the data that has been represented in Figure 4-8 could have include, to what level is BIM used on project works, ie is it only to the third or fourth dimensions or is it utilised all the way up to the seventh dimension and lastly. Including a question of this nature would have given an understand on if business are only using BIM in a way which it full benefits are not being had by users in these companies.

4.2.3 Survey – BIM Adoption, Training and Effectiveness

One of the key significant drivers of the research was understanding how BIM had been adopted, the participants were asked to give an indication of when BIM practices or processes had been adopted in their place of works to give an indication of when there business had (or hadn't) adopted these practices.

In reference to Figure 4-9 below 55% of people were able to indicate that BIM had been implemented within a specific time frame. The breakdown as follows

- 0 – 2 years range – 20%
- 2-5 years range – 20%
- 5+ years range – 15%

The data indicates that 40% of the participants specified that their business had adopted BIM practices. While a limited sample this does align itself with trends that BIM practices are continuing to become readily adopted by the types of organisations that have been included in this research. This is evident in Chapter 2 of the report where governments are starting to drive BIM adoption movements around the country in the hope that private industry does the same. Underlying research around BIM adoption suggest that while it continues to occur it is still can be categorised as having 'a long way to go'. Adoption, as covered in the literature review is dependent on many aspects and factors to which will vary from businesses to businesses. To fully understand the way in which BIM has been adopted across the different businesses which have been included in this study would be to individually analyse the business and understand if integrating BIM would be a viable option. Based on the responses of the group so far though it appears that a significant portion have now made this leap into BIM in some capacity or at least engage with specialist that do.

However, a relatively large portion of participants, 35% did say that they did not know if their own department or business had implemented BIM practices or processes over any of the time frames given in Figure 4-9. What isn't highlighted in regard to the specific data collected around adoption rates, and needs to be considered is that even if the participant couldn't specify the exact timeframe in which BIM practices were adopted this does not necessarily mean that the department or business has/had not adopted these practices. This is backed up by figure 4-8 which indicates that 85% indicates there business used BIM for project specific work, which could conclude that the 35% understand BIM has been implemented in their business, just perhaps a lack of perspective on the time frames for implementation.

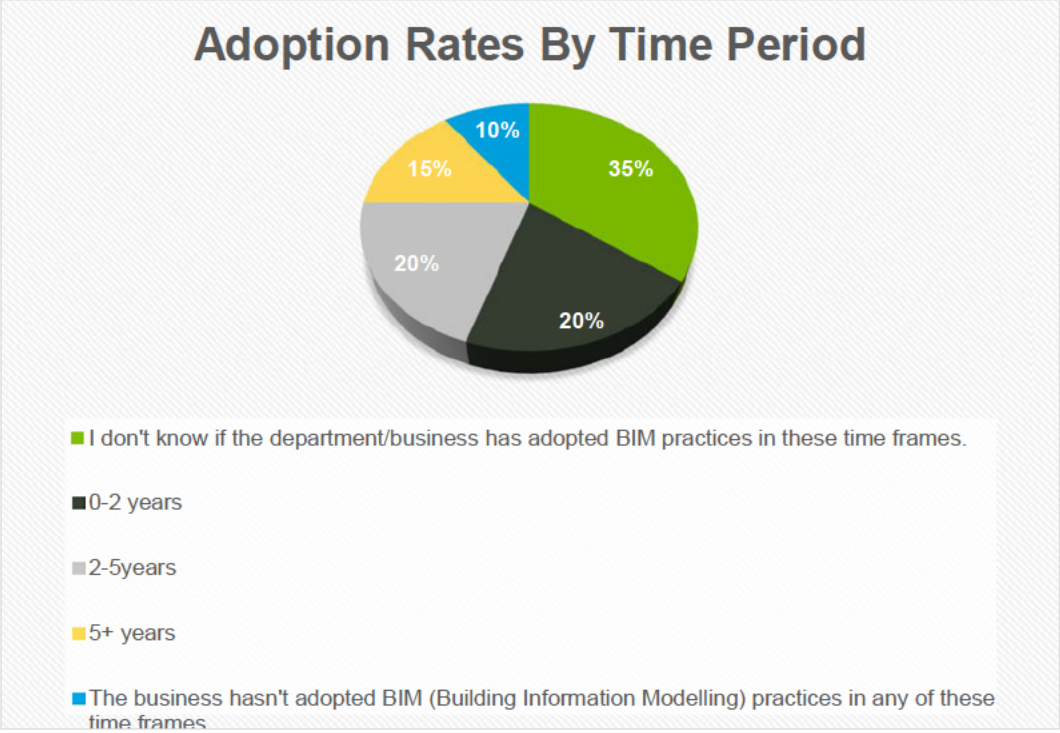

Figure 4-9: Adoption rates by time period

It appears throughout the line of inquiry that is developed throughout the the survey an underlying positive trend that appears regarding the adoption of BIM within the industry is that is that workers and industry professionals do, as a minimum have an understanding that BIM is being used, what it is being used for and that there companies do use it as a way of delivery their work.

However, one of the negative aspects is that while it is being adopted it appears as though people working in the industry need continued education and training on the subject. As referenced in the literature review, one of the key elements holding back those that are adopting and have plans to implement BIM into their work places is that there is a lack of quality training and skilled workforce that adequately addresses the time, effort and investment that it can take to implement BIM processes/practices in a strategic way that allows for productive use in the management of construction projects in the industry.

Figure 4-10 below shows that when asked if participants would be open to additional training an development in the utilisation of BIM processes and practices 90% responded yes, with 5% noted they would be unsure and 5% saying they 'no they would not be open to additional training.

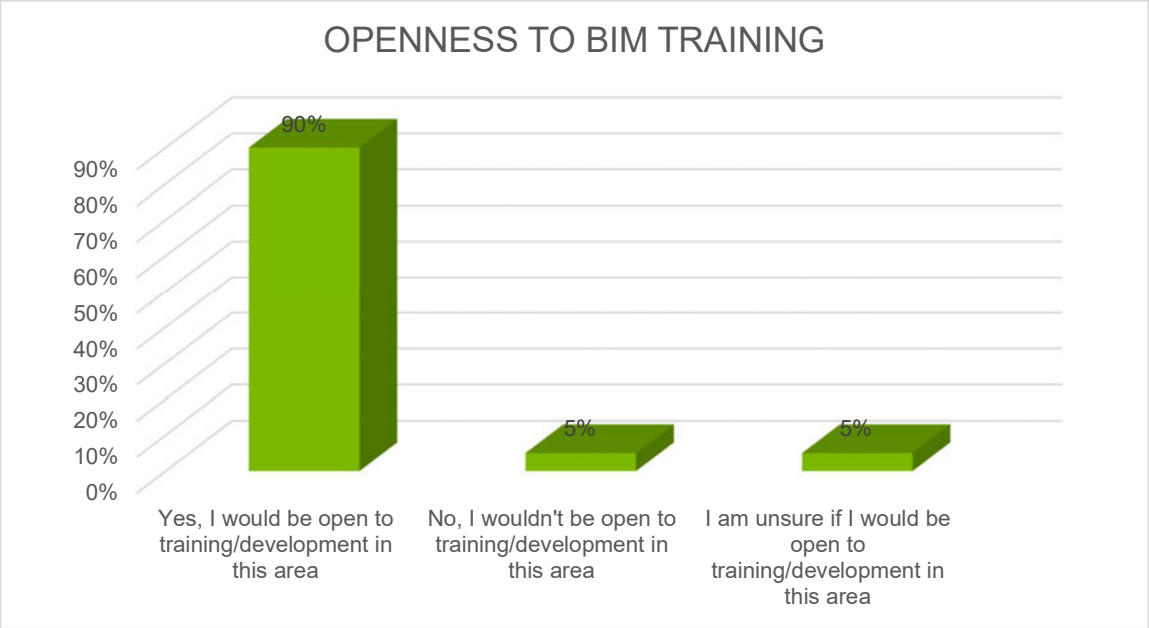

Figure 4-10: Openness to BIM training

Adoption and upskilling are elements of BIM that need to go hand in hand and with the adoption rate being above 55% over last 5 year period based on Figure 4-9 it would be vital to include an element of training from a business perspective.

The purpose of the line of questioning developed for the survey was to ensure that the key objectives could be analysed, the final question asked of participants based on their own understanding of BIM practices, do they believe that it is an effective way to manage projects (implication that management from design through to construction). The response indicated that overwhelmingly, approximately 80% of respondents (see figure 4-11) considered that building information modelling processes and practices would be advantageous (effective) in the management of construction project in Australia.

This result is unsurprising based on the information that was collected throughout the survey, people were in the majority on most of the key points discovered throughout including, understanding what BIM was, understanding that it was utilised for project works within their workplaces, understanding what functions and capabilities these practices hold.

Based on this it is unsurprising that results indicate that it would be effective in the management of construction projects. It is clear here that the level of understanding of BIM equates to being able to imagine or perceive the benefits it has in the management of projects.

Based on the information highlighted in the literature review by Qian in 2012 there are many benefits which are gained using BIM in the management of a projects. Refer to Chapter 2 – Literature review and refer to figured 2-1 and 2-2 for the benefits that BIM brings on a project level.

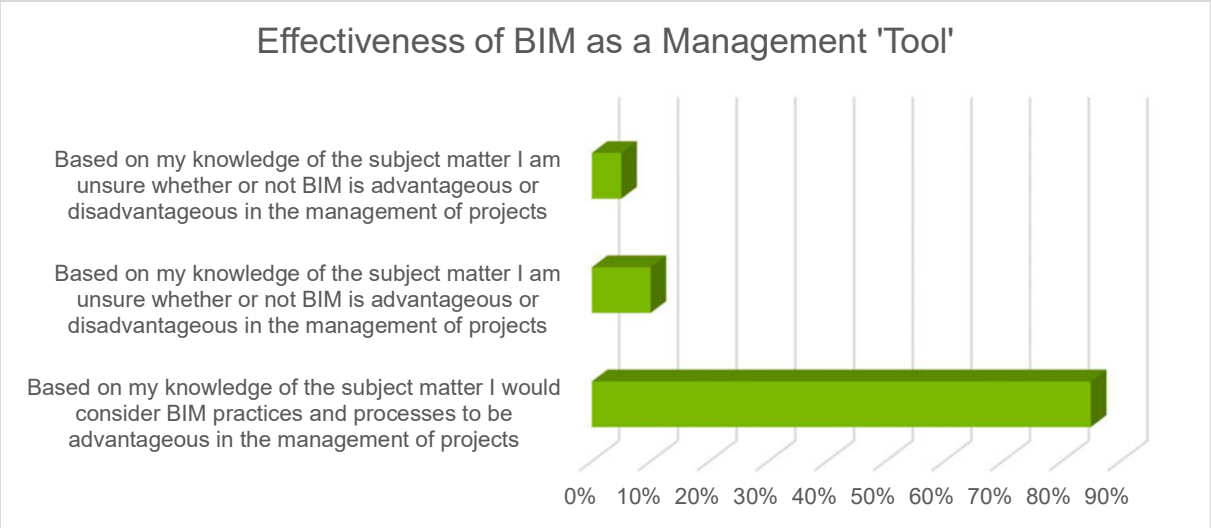

Figure 4-11: Openness to BIM training

4.2.4 Survey – Key Findings and Discussion Points

Sections 4.2 to 4.2.3 have outlined the results and discussed the key findings of the data, the following is a summation of the key findings and discussion points

- The diversity of the data from the participants, reflects the diversity of the industry regarding the businesses that workers in Australia are employed at and also the jobs that they hold within these businesses
- It was found that the level of BIM of awareness is quite high. This is even when taking into consideration the fact that not many of the participants (only 30%) only used BIM in their Day to Day work routines

- The level of understanding of BIM tends to be aligned with jobs that have a design element included in them, including engineers, designers, BIM specialist and Architects.
- That despite the numbers who participated that actually used BIM the understanding that BIM was used in the management of projects with in their companies was high (85%).
- That adoption must at least be steady in the industry with 55% people being able to say that they have seen BIM adopted over the last 5 years.
- That 90% of participants would be willing to train (or upskill) in the area of BIM, thus gaining a greater understanding of its ability to manage projects efficiently and effectively
- 85% of participants with the knowledge they had about building information modelling were comfortable in saying that they would consider BIM processes advantageous to the management of construction projects.

These were the key conclusive findings that came out of the survey. Some clear trends emerged specifically regarding the level of awareness industry workers have regarding BIM. Below is an analysis of the data gathered from the questionnaire.

4.3 Questionnaire – Results and Discussion

The following is an analysis and discussion of the data collected via the questionnaire conducted. It allows for the data that has been collected to be analysed against the aims and objectives of this research in order to find key pieces of information and understanding of the aims and objectives of the research

As per the methodology in Chapter 3 of the report the Questionnaire included those that specifically have a knowledge of BIM, which would be considered greater than the average worker in the Australia construction, engineering or architecture industry, questioning the participants was based on their level of interaction with and utilisation of BIM practices and process in their job. It wasn't exclusive to those that use BIM but also included those that may benefit from or work closely with teams that use it to manage the delivery of projects in their work environments. The questions asked included those that could be elaborated on by those

that participated and thusly aided in collected the thought and ideas of those that participated into trends which help explain and meet the objectives and aims of the project.

The collection of this data allows for the analysis of quality qualitative data that can be used for cross analysis between those interviewed and the findings of the survey as well. This allows for a direct look at the numbers based on those that participated on the survey.

Below is a cross analysis of responses given by participants and the relationship this data has with the key pieces of information determined by the survey as well as the literature available on this topic.

4.3.1 Questionnaire – Participant Diversity

Like with the survey, it was important that diversity of opinion was heard in the questionnaires. This is evident by the fact that each of the participants were from different business models and all held different roles. This allowed for perspective to be different and to understand if the broad nature of job titles and roles in the industry have any real impact on the answers given when asked specific questions about BIM adoption and effectiveness, and other closely related topics.

Those interviewed held the following roles:

- Project Manager
- Senior Civil Designer
- Architect
- Interior Designer
- BIM and Digital Engineering Consultant Manager
- Digital Model Manager

The results are as follows, as with survey the questions developed for the questionnaire were specifically done in order to understand the key objectives of the research. The significant difference here is that those that have participated are persons that are considered frequent user of BIM or those that tend to have a deeper than expected understanding of BIM and its function and capabilities and have a level of interaction that would be considered significant in that they can not only provide insight into the specific of how BIM is used in their role but has a wider understanding of its implication in that management of construction projects industry wide.

The following section of the report will cover the questions asked in the questionnaire (see Appendix D) and the responses given to those that participated. The idea was to find any trends thoughts and conclusive pieces of information which can be actualised against existing research and other empirical data collected as a part of this research.

4.3.2 Questionnaire – BIM Awareness

The questions asked as part of the questionnaire were more direct with an understanding that those participating were in positions where they were considered to have a deeper understanding of BIM practices and processes as it was something they frequently used or experienced as a part of their daily duties.

The figure below shows the data collected after the participants were asked if they thought overall was BIM used effectively as a construction management tool in the Australian industry. The majority (83%) said yes while 17% (1 participant) said no.

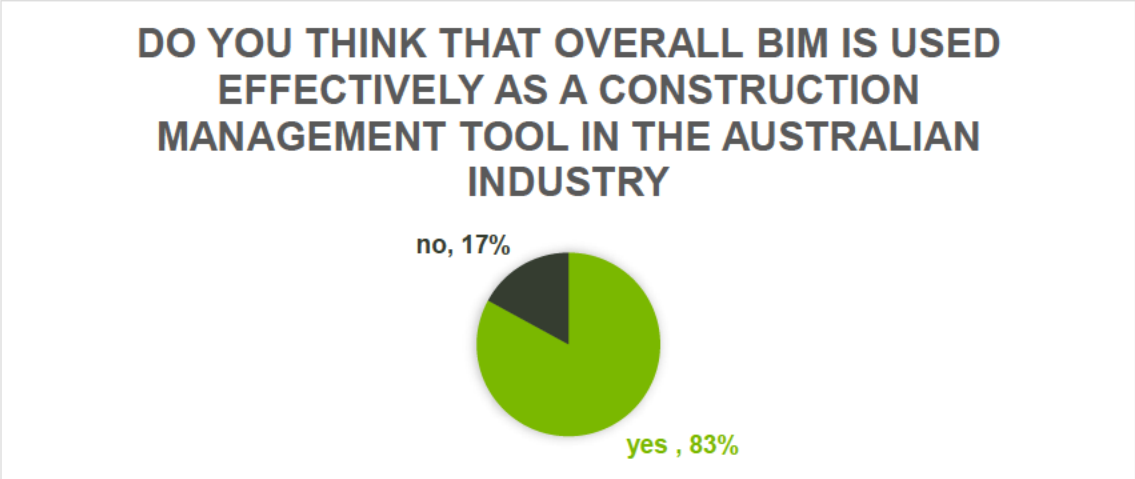

Figure 4-12: Is BIM used effectively as a construction management tool in the Australian Industry.

While the data in figure 4-12 indicates that asking directly about the effectiveness of BIM as a construction/project management tool indicated a consensus that it is in fact an effective way of managing projects it was an important part of the research to consider responses of a more reflective and considerate nature.

One of the key questions asked was directed at the utilisation of BIM in the management of projects and whether or not those users in the Australian industry use the practices and processes of BIM in a way which unlocks the full potential. There was consensus across all

participants when asked this specific question, all stating in the first instance that they didn't believe that BIM was used to it's full protentional. While all answered the same way in the first instance the way in which they elaborated hit on a number of key overall issues as can be categorised below

- That BIM can be a complex set of practices and processes which companies don't necessarily invest adequately enough in.
- That BIM is a collaborative approach and that this means all parties, consultants, contractors clients etc need to be committed to use for development of a central model and being on the same page
- That full potential of BIM is broad and deep and that the needs of those companies that adopt aren't always in line with all of the potential advantages that BIM provides in the project space, refer to Figure 2-1 in the literature review to see the known project benefits of BIM
- BIM is not necessarily suitable for all projects, ie the cost benefits of using these practices and processes on small projects may not be viable on small projects, therefore BIM potential while great may not be beneficial in all scenarios
- That BIM is commonly used for its 3D modelling capabilities and often not beyond that as companies only require this particular function from BIM processes as part of the services they provide
- That BIM is not currently something that is stringently enforced on projects, however as highlighted in the literature there is movement from state government for mandates on the use of BIM on large scale projects.

4.3.3 Questionnaire – BIM Adoption

Continuation of adoption of BIM practices and processes is a key in the Australian industry to aid in facilitating the use of BIM in the effective management of projects in Australia. Participants were directly asked about the factors which may impact a business, whether they be external or internal that may stop a company from adopting BIM practices.

Each of the respondents had a slightly different takes on why this might be the case, a lot of what respondents said does align itself with the information which can be found in the literature review. Some of the key trends found in the response to this question included

- Cost/Money – respondents who noted costs did so in a couple of different forms, those being cost related to implementation and training and those specifically about being able to generate enough fees on projects which would make building information modelling not a viable option in the management of a project
- Potential – The lack of businesses and companies to see the potential of BIM implementation and the benefits it would achieve in the management of projects.
- Lack of managerial foresight – understanding how BIM and digital methods a positive influence on impact on the services that a business provides.
- Lack of a fully skilled workforce and how that lack of training in the industry someway contributes to business in Australia not adopting BIM as freely despite the perceived benefits.

While the specific factors which may influence the adoption of BIM within a company were considered by the participants there was a follow up which was more pointed in asking if their was a reluctance to adopt BIM practices in the Australian industry. The responses, unlike some of the other questions asked as part of the interview were more mixed with information being more specific to their own specific corner of the industries reliance on or adoption of BIM. The following key trends were discovered in the response to this question:

- Those working in architecture firms tended to indicate that they believe that utilisation of BIM was common practice within their sub-section of the Australian industry. From their experiences these participants were the highest adopters of BIM processes with engineering services disciplines like the hydraulic and electrical disciplines appeared to be more reluctant.
- Those who were BIM manager or digital modellers tended to be of the suggestion that the size of the projects which projects undertook had an impact on adopting BIM practices. The sentiment being that smaller scaled projects that could easily be more quickly managed without the elements of information/data management associated with BIM.
- Reluctance from companies dependent on the size of the business, the lack of an appropriately trained workforce and the level of integration that a business is willing to invest in seemed to be the other key trend that was dominant in the responses to the query regarding adoption in Australia.

While understanding the impacts that might affect BIM adoption questions participants were specifically asked about BIM use in their own businesses. Of those interviewed the response was overwhelmingly that BIM processes are used throughout the project lifecycle in a collaborative way, with 5 of 6 participants saying their businesses used BIM in this way. The remainder noted that while BIM was used it was scarcely and dedicated to large scale projects in which case BIM would be used throughout in a design and construct model. What this does indicate is that those that do use this process do not exclusively use it for the construction phase of projects, it is often used throughout the project lifecycle because of the collaborative nature in which building information modelling is built to function, i.e. at a level which encourages integration and collaboration throughout.

While understanding how BIM is utilised within the different businesses in the Australian industry, participants, based on their perceived level of knowledge of BIM were asked directly if they believed that BIM was an effective tool in the management of construction projects in Australia. The overwhelming consensus was that it was, as can be seen in figure 4-13 below.

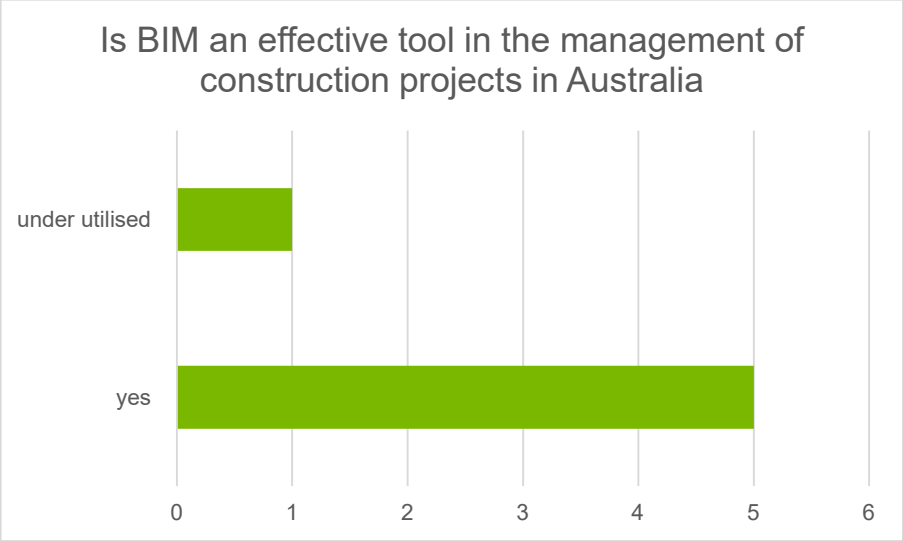

Figure 4-13: Is BIM an effective tool in the management of construction projects in Australia.

While figure 4-13 does show the majority agreed with the statement, one of the employees from a state government department did make a point which become a theme throughout and can be found in the literature and that is BIM appears, wrongly or rightly to be underutilised within Australia based on the capabilities that we know it brings to the table. We know from Figure 2-2 of the literature review that project benefits are obvious and have been observed.

Does this give consideration to the fact that BIM is underutilised despite the facts on project benefits and advantages or it likely does indicate that fact that private enterprise is more likely to integrate new processes like building information modelling into their workplaces. Based on section 2.2.4 of the literature review the government (particularly in Queensland) has only began to develop mandates for the use of BIM on government projects over the last couple of years.

4.3.4 Questionnaire – BIM Effectiveness

While throughout there has been a general consensus about the effectiveness of BIM as a way of managing projects the question of the participants was asked regarding Australia's standing in the world regarding the utilisation of BIM, specifically if the Australian Construction (Archetiecture, Engineering as well) industry were 'behind other industrilsed countries regarding the use of BIM in managing projects. A number of clear answers were given by those that participated

- Half of the respondents were clear about not being able to comment due to not following global BIM trends, or not being sure what global impact that BIM currently had.
- The BIM Manager/Specialist which was interviewed mentioned Australia being world leading in elements of BIM but not in others, with specific reference to government policy.
- Other countries appear to be more 'advanced' in their use of BIM utilisation within the industry.

The participants responses to this particular questions was telling in that even those that have a 'good' base level knowledge of BIM offer different opinons about where Australia stands in terms of using BIM in relation to other industrialised nations.

One of the aspects of BIM which is relatively well documented are the known advantages (and disadvantages) of its use in the management of projects the participants were asked, their own words to describe the key advantages and disadvantages, with the results being able to be summarised as follows

Advantages

- Efficient model productions
- Provision for accurate data storage/modelling
- 3-Dimensional visualisation
- Clash Detection
- Full integration with other models
- More effective project management
- Standardisation of Data sets
- Less Re-work
- More collaborative design/construction approaches
- Easy to manage several different disciplines
- Aid in cost estimating activities
- Aid in development of constructability and methodology planning activities
- Client not always willing to participate in model/dataset develop using BIM processes.
- Able to be used for public consultation purposes

Disadvantages

- Difficult to utilise software if not appropriately trained
- Higher need for data management – if which many are not use to in construction specifically
- Higher upfront software costs
- Higher upfront training cost
- High interdependencies on other parties on project

These key advantages and disadvantages are variation of what can be found in the liertautre regarding BIM and as with this data the advantages given tend to outweigh the perceived

disadvantages. Understanding the advantages, like those listed above are able to help corroborate that BIM is an effective tool in the management of projects as it offers all these benefits specifically at a project level.

As a way of understanding if using BIM is a viable way to manage projects in Australia it needs to be understood whether or not there is a workforce which is capable of using BIM for these purposes. The participants were asked if the country (Australia) had enough skilled workers in the BIM space to adequately train and mentor those moving into the future. A a mixed response was given with two respondents definitively saying yes, two participants saying no and one being slightly reserved in saying 'not really'. The response did help to highlight the following

- Those working in architecture businesses said they did believe there was a significantly and well trained enough work force that could be a way in which Australia passes this knowledge onto the next lot of industry professional who emerge in this space into the future. Also noted was the fact that skills in this digital modelling spaces are now more widely taught and encouraged over older 2d modelling methods
- The BIM consultant/manager mention that there was 'not really' a workforce that would be considered adequate regarding training going forward, however it was noted that the problem seen from this perspective was that software training was not the issues instead the lack of middle and upper levels of management not being understanding or engaged on BIM as a way forward for their business and that a larger level of collaboration between businesses and companies would help to foster the more holistic approach that BIM can have in the way of managing projects
- The remainder of the participants held the perspective that there currently wasn't a workforce that was skilled enough to usher in and aid in the adoption of BIM in businesses in Australia, however there was a level of optimise that with the current skills of engineers, designers and others on 'complex' modelling software that bridging the gap may not be as excessive as feared in the reskilling of worker if necessary as BIM practices become a more popular choice in the workplace.

Making use of the advantages listed above is key to ensuring that the Australian industry can feel comfortable in understanding using BIM for the management of projects within the industry. One of the key components of effective management of construction projects is the contractual requirements and nature of the relationship developed between parties. The

respondents were asked to provide context around how the contractual component of managing projects is impacted by BIM.

While there was a mixture of responses given to this question those that said no, specifically sited that in their particular workplaces that 3D models developed through BIM practices to be a part of the contractual documents they provide as a part of their services and there was express reassurance that they had not experienced any negative contractual issues regarding the use of BIM in the management of projects.

The other respondents were more optimistic in the views expressed with the trend being that the efficiencies in the management of projects were definitely an overall benefit to the management including from a contractual point of view in which elements like less design error and rework, more collaborative approaches to design amongst other things would have an impact on contractual relationships with less likely hood for issue pertaining to variation and time delays specifically.

4.3.5 Interview/Questionnaire – Key Discussion Points

Sections 4.3 to 4.3.4 have outlined the results and discussed the key findings of the data, the following is a summation of the key findings and discussion points

- That dependent on what type of business for which you work will have an impact on how you see the utilisation of BIM for the management of projects in Australia. Architects tend to believe that there sector uses BIM to its potential more often than not.
- There is consensus that people in the industry believe that BIM is an effective way of managing projects because of the benefits that it brings
- That BIM has several significant advantages in the management of projects, which tend to outweigh the disadvantages
- . There is a belief there is still a reluctance in some instances in to adopt BIM practices, with topics being cost/money, lack of foresight, lack of a skilled workforce and business potential
- Understanding that BIM can have an impact on contractual matters when it comes to management of project

These were the key conclusive findings that came out of the questionnaire. Some clear trends emerged specifically regarding the effectiveness of BIM as a management ‘tool’. Below is an analysis of the data gathered from the questionnaire.

4.4 Case Study – Results and Discussion

The following is an analysis and discussion of the data collected via a case study selected which included a project which used BIM practices and processes in order to manage the projects. The project selected was a high-rise office building located at 1 Bligh street in Sydney. The case study investigates the experiences of consultants and contractors adopting their first multidisciplinary BIM base project.

The way in which the case study has been analysed aligns with the criteria questions that were developed and highlighted in the project methodology (see Chapter 2 of the report) each of the questions were specifically developed in order to understand the case study and breakdown how its success based on the key research objectives and aims of the project.

Each of the developed questions for the criteria have been broken down below, with information from the case study analysed to gain an understanding of how the project performed and how its outcomes align with the research aims and objectives of the project.

Please see section 2.3 of the report for a brief project overview and details of stakeholders and other case study particulars

4.4.1 Was there an element of training involved in taking on the BIM processes and practices for this project

There was an element of training involved in the Bligh Street project. The approach by the architectural firm was that the approach needed to be on the job training as a way to experience the software. However it should be noted that those that already had experiences in 3D modelling software, like revit were required to be upskilled so that a base level of knowledge could be worked from.

The design technology director from the architecture firm working on the project noted that the best type of training is one that gives immediate answers to questions that might be had and that the best type of help you can receive from somebody already suitably qualified and this preferable to sending somebody off to training *(CRC Construction Innovation)*

What this does indicate is that training is an important part of BIM practice implementation but it is not restricted to the 3D modelling component, it is also training yourself to have a deeper understanding of building components, there is constant thought about how things are being built and subsequently really gaining an understanding of how the building process works as noted by the lead project modeller.

It was noted that the structural engineering company in particular had an ‘apprenticeship style program in place in which they developed there staff in structural detailing procedures. This indicates that companies that do utilise BIM on these projects do have an understanding of what is required in terms of skill level to deliver their services using BIM processes.

4.4.2 Disadvantages/Problems of using BIM on this Project

The level of detail for which the BIM was used on this project was one of the major problems encountered by the project architect and their team. The level of utilisation of building information modelling processes depends on the level of detail that is prescribed by the requirements of the project. What needs to be understood is what information specifically is going to be taken from the model and the expectation on how the model will evolve.

Over detailing on a project of this magnitude would cause issues with uneccessery modelling and additional work that would be associated. As the case study defines developing an overly large model would cause issues to the point where it would 'slow down' to the point where all the efficiencies gained by modelling initially would be lost.

The size of the model was an issues on the Bligh Street projects in which the physical time it took to 'wake up' the model would be significant, any required changes then become a slow process.

To combat this the architect went with a hybrid approach in that numerous models were developed, as opposed to one large one. This however goes against the main purpose of implementing BIM practices and having a single model/data set for a project

4.4.3 Advantages of using BIM on this Project

One of the key benefits found on the project with the implementation of BIM was one of the most commonly sited benefits of implementing these practices and that was the multidisciplinary collaboration which was able to take place. In this case the architect and structural engineering services in particular collaborated with both using the same software suite in model development, in this case the structural engineer was able to develop its model based on what the architect had developed (reference). This meant that manage the project at this level was able to be seamless with the import and export of elements from the different service lines able to occur without having compatibility or other similar issues.

The projects structural engineers found that using BIM practices that an increase in productivity was noticeable, this coming form the fact that multiple views were able to be generated from the single source of truth in the model. This effect was ultimately felt in the quality assurance process as well with all of the generated data coming from a single source of truth and not relying on manual development of this documentation.

One of the key advantages of using BIM in this case study was also the 3D visualisation element, this allowed the structural engineer in particular to really understand what they were designing and developing for the purpose of the project. The company director of the structural engineering company simply states that 3D gives you a far better understanding of what is going on rather than old fashioned 2D models (reference).

The anticpated benefits of using BIM on a project like this from a contractors perspective is that a fully integrated and coordinated model and subsequent documentation from consultants can be expected. This being a way in which translation from design to construction could be smoother based on the level of information the contractor has. As is commonly known elements

like clash detection also provide benefit to a contractor in that issues may be forseen or eliminated earlier on than might regularly occur.

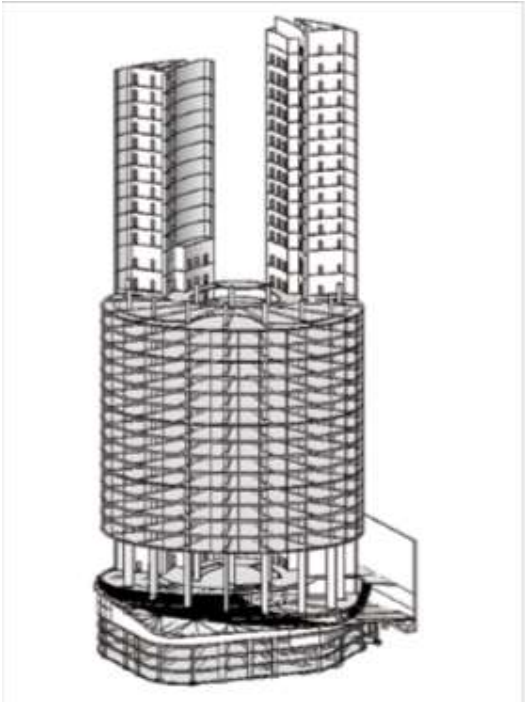

Figure 4-14: 3D Structural Model Developed for the Bligh Street Project

4.4.4 Was a BIM approach an effective way to manage this project

Overall, it appears the example of utilisation of BIM on the Bligh Street project was a relative success, particularly with this being one of the first commercial projects in the country to implement the multidisciplinary aspects of BIM.

What the case study does highlight that when different workers from different services providers (ie architects, structural engineers and contractors) come together with a collaborative mindset that they were able to work together to manage a complex project. While some disadvantages have been identified the advantages of model development and sharing outweigh those disadvantages and with direct. Collaborative trust was a common theme, and this being identified signifies that the parties involved understood that this trust would be a significant driver in the manager of a project using such processes to such a significant magnitude.

From a contractual view it was even stated that the development of the BIM model would save sub-contractors and other parties significant time, however to the possible detriment of he contractor this would take away the ability of making money (suspected through way of variation) in the potential grey areas. While this may be seen as a loss of possible income to the contractor overall this demonstrates BIM potential impact on managing construction

projects in that the processes becomes more efficient in where 'grey areas' are minimised and thus so is additional rework, which is a common hall mark of BIM utilisation on a project.

4.4.5 Case Study – Key Discussion Points

Sections 4.4 to 4.4.4 have outlined the results and discussed the key findings of the data, the following is a summation of the key findings and discussion points

- That on the job style training was the best way to adopt these practices.
- Some disadvantages including understanding the level of detailed required
- Significant advantages to managing project with BIM like Blih Street. Including multidisciplinary collaboration. Quicker methods of generated documentation, better understanding of constructability issues
- Overall, it was determined that BIM was (and is) an effective way to manage project like this. Contractually this is an advantage with less rework and variations likely.

These were the key conclusive findings that came out of the nominted case study. Some clear trends emerged specifically regarding the effectiveness of BIM as a management 'tool'. Below is an analysis of the data gathered from the questionnaire.

Chapter 5 – Conclusion

5.1 Conclusion

A number of key findings and trends were developed based on the research conducted for this projects. The key findings broadly indicate that BIM practices are still being adopted in Australia, though determining at what rate is difficult. The research also ultimately shows that BIM is an effective way of managing construction projects in Australia, throughout the entire lifestyle from design to delivery.

The review of the literature and the collection of various data from the survey, questionnaire and the case study, the research indicates that BIM overall is a positive experience in the Australian industry.

In the culmination of the data and key findings from each of the methods, survey, questionnaire and the cases study there were some key findings that align with the main objectives and research goals of the project.

The key findings of the research can be summarised as below.

Awareness and Utilisation

- That dependent on what type of business you work for and what position you hold will have an impact on how you see the utilisation of BIM for the management of projects in Australia.
- That despite not necessarily working with BIM process/software on a day to day basis that many within the industry still have an understanding of BIM and its capabilities and potential in the industry.

Adoption

- That adoption of these practices has continued with an increased level of awareness of business and companies implementing these practices in the departments/teams within their business.
- That training and upskilling is a large part of driving adoption of BIM practices and that one the job training is a good way to adopt these practices and in understanding their benefits
- There appears to be a reluctance in some instances in to adopt BIM practices, with topics of concern being cost/money, lack of foresight, lack of a skilled workforce, business potential and size of the business all having an impact on adoption of these practices.

Effectiveness as a management tool

- Significant advantages to managing project with BIM. Including multidisciplinary collaboration, clash detection, constructability awareness, document control and cost benefits
- There are also other key advantageous, namely from a contractual viewpoint in that there is less likely to be issues with poorly documented works resulting in variations and delays
- Overall, it was determined that BIM was (and is) an effective way to manage project in Australia.

It should be noted that these key findings are derived from several different sources and collection methods and that those mentioned above are the common themes and trends which emerged to be consensual between the different levels of analysis undertaken for the project.

Based on the results gathered and outlined there is room for additional future works to be undertaken around this topic, refer to section 5.3 were these future works are discussed.

It should be noted that there was one significant limitations to the research, being the limit sample sizes used for the survey and questionnaire. The sample size was impacted significantly by the Covid-19 pandemic, which caused issues with people willingness to participate in the process as they adjusted to their new situations. In order to mitigate such a situation as last time the top propriety would be locking down a sample of the population early to commit to being involved in the research.

5.2 Future Works

Ultimately while the research has endeavoured to give a snapshot of BIM awareness, adoption and effectiveness in the management of projects in Australia there is no doubt that additional future works and research could be developed in order to gain understanding of specific areas of BIM in the Australian industry. Some of the key areas of research in the future could possibly include:

- Research into the adoption and utilisation of BIM in small to medium enterprises
- A comprehensive study of the impact that managing a project with BIM has on cost quality and schedules of projects
- Engage with government stakeholders to understand the impact BIM is having on them (as opposed to just private enterprise)

- A cost benefit analysis on what sort of projects you would need to run to make BIM a legitimate and viable option for a business to adopt.

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Appendix A – Project Specification

ENG4111/ENG4112 Research Project

Project Specification

For:	Adrian Nowak
Title:	Building Information Modelling (BIM) and its adoption and effectiveness as a tool in the management of construction projects in Australia.
Major:	Bachelor of Construction Management
Supervisor:	Amirhossein Heravi
Enrolment:	ENG4111 – EXT S1, 2020 ENG4112 – EXT S2, 2020
Project Aim:	To evaluate BIM and how its implementation impacts and influences performance in the management of construction projects in Australia and to determine whether BIM is used effectively on projects in Australia. By understanding the implementation and influence of BIM on Australian construction projects the underlying causes with the adoption of BIM across the industry can be further examined

Programme: **Version 1, 18th March 2020**

1. Research background information relating to BIM and its effectiveness as a management tool in the construction industry.
2. Research the benefits and shortcomings of BIM in construction projects.
3. Research BIM in the Australian construction industry and how and where it is implemented as a management method/tool
4. Design a survey that will be distributed within industry and collect data regarding BIM utilisation and awareness in industry.
5. Design an interview that will be held with industry professionals and collect data about the everyday use if BIM those that use BIM in their day to day work
6. Evaluate different BIM case studies with respect to the benefits and shortcomings of using BIM as a management tool in real life project scenarios
7. Evaluate the underlying causes and trends which influence/have influenced the adoption rate of BIM in Australian construction.

Appendix B - Risk Assessment

Due to the nature of this project, there isn't the requirement for experimental or field-based work. The study and analysis of the data collected, outlined in the methodology will be completed via desktop methods, for example data collection and analysis etc. Therefore, there is no real discernible risk to humans and peoples that will be involved in conducting the research and it can be concluded as such the risk lies exclusively in the project itself.

However, there are significant project risks which if not mitigated, handled and planned carefully could have significant negative impact on the project. These project risks can include aspects like loss of confidentiality with data. Table 7 below is an assessment of the project risk based on the risk matrix below (Table 6) from which the level of risk is determined.

Table 6: Risk Matrix

	Impact				
Likelihood	A. Negligible	B. Minor	C. Moderate	D. Significant	E. Severe
1. Very Likely	Low Med	Medium	Med Hi	High	High
2. Likely	Low	Low Med	Medium	Med Hi	High
3. Possible	Low	Low Med	Medium	Med Hi	Med Hi
4. Unlikely	Low	Low Med	Low Med	Medium	Med Hi
5. Very Unlikely	Low	Low	Low Med	Medium	Medium

Table 7: Risk Assessment

Rating	Hazard/Risk	Risk	Mitigation
C4	Trouble with getting industry professionals to participate in the collection of date via way of surveys and interviews	Low Med	Engage with different industry professionals and personal early on in project schedule. Offer incentive for their participation. Prepare contingency in terms of research methods for project. Ensure that the research being conducted is well explained as to reduce concerns that participants might have about the
C4	Survey/Interview responses have perceived biases from those that have participated in the interviews and surveys	Low Med	Ensure that data which is collected from studies doesn't have any ethical implications. If unethical responses have been provided data to be determined by researcher if still valid or to be deemed as unusable in data analysis and results.
D4	Loss of confidentiality for project data acquired from company for case studies and lesson learnt research. Potential legal fall out if loss of confidentiality occurs.	Med	Ensure that only the necessary data is obtained from company sources. Do not share data with other and do not openly discuss data that may be confidential in public. Make it clear to university that data is confidential and may not be released without permission by its owner/s
E4			
C3	Obtain results which are counter intuitive to the analysis of information for the purpose of the project	Med	Have clear methods, tools and resources to aid in capturing quality results. Including using suitable software and programs for data collection.

E4	Run out of time to complete research and associated tasks and have trouble submitting dissertation on time	Med High	Ensure that project schedule is stuck to closely and has contingency plans and risk built into consideration. Plan for all major aspects and develop understanding of the critical activities required for the completion of the works.
D5	Loss of data, research, results analysis or any component of dissertations	Med	Back up of records, data research and drafts. Upload to online storage, and back up storage hardware
E4	Ethical clearance gets rejected	Med High	Ensure that research conducted doesn't have to have ethical impacts on those participating. Ensure that approval is obtained from the Human Research Ethics Committee prior to sending out interview and research questions.

Appendix C – Survey Data

Building Information Modelling (BIM) and It's adoption and effectiveness as a tool in the management of construction projects in Australia.

Survey response 1

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Project Manager - C ent s de project manager n the de very space.

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
Mode based process that g ves AEC profess ona ways to p an, des gn, construct and eff c ent y manage projects

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM Pract ces n my da y work

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
I don't know f the department/bus ness has adopted BIM pract ces n these t me frames.

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of w ngness by c ents to adopt these pract ces

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

Survey response 2

Response ID
2

Date subm tted
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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
45+

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Project Manager - my ro e s to prov de program and project management serv ces to de ver projects under Department of Defence's Estate Management Program.

Do you know what Bu d ng Informat on Mode ng s?
No, I do not know what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
I do not understand the understand the funct ons, processes and capab t es of BIM.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM pract ces n my da y work.

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
No

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
I am unsure f the company uses BIM processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
I don't know f the department/bus ness has adopted BIM pract ces n these t me frames.

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
I don't know

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I am unsure whether or not BIM s advantageous or d sadvantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

Survey response 3

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
45+

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Project Manager

Do you know what Bu d ng Informat on Mode ng s?
I somewhat know what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ' I do not understand the understand the funct ons, processes and capab t es of BIM.'
Mu t -d sc p nary, coord nated mode of 3D objects on 2D draw ngs

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM pract ces n my da y work.

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
2-5 years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Other

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]
Need to mature the concept from us ng t as a des gn too to a constrcut on contract management too

Survey response 4

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4

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
45+

What company do you work for?
Aurecon Austra as a Pty Ltd

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Sen or C v Eng neer. I co-ord nate mu t -d sc p ne des gn projects at var ous stages n the r fe cyc e, concept through to deta des gn works, and often am nvo ved n construct on phase serv ces. I am a so often nvo ved n asset cond t on assessments tr ggered by regu atory, ma ntenance or cap ta dr vers.

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
BIM s the fourth d mens ona capture of an overa fac ty's asset. It captures a the nd v dua components of a fac ty n a work breakdown structure (WBS), n a spat a co-ord nate system, and ass gns each nd v dua component ts parameters n the fourth d mens on. The fourth d mens on s the database component. Depend ng on how we t has been set up, t can prove very usefu for future asset management of the fac ty.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM pract ces n my da y work

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
0-2 years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Other

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]
We wou d adopt t by defau t

Survey response 5

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
FKG Group

What c ass f cat on does your company fa under?
T er 2 Construct on Company

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
S te Eng neer

Do you know what Bu d ng Informat on Mode ng s?
I somewhat know what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
Integrated p atform for end to end construct on to a ow for eff c ent p ann ng and execut on of bu d ngs and nfrastructure

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
'I do not use BIM pract ces n my da y work'

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
I am unsure f the company uses BIM processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
I don't know f the department/bus ness has adopted BIM pract ces n these t me frames.

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
I don't know

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I am unsure whether or not BIM s advantageous or d sadvantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
35-45

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Sen or Structura Eng neer

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ' I do not understand the understand the funct ons, processes and capab t es of BIM.'
BIM s a too wh ch can comb ne mu t -d sc p ne des gns nto one package, genera y n 3-D, and often nc udes a gor thms for c ash dent f cat on and other des gn a ds, as we as prov d ng a range of v sua zat on opt ons.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM pract ces n my da y work

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
2-5 years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
I don't know

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
I am unsure f I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Other

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]
C ents cannot afford th s eve of serv ce

Survey response 7

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
45+

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Project manager / Sen or C v Des gner

Do you know what Bu d ng Informat on Mode ng s?
I somewhat know what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ' I do not understand the understand the funct ons, processes and capab t es of BIM.'
BIM s a 3D representat on of the nteract ons between a serv ces and structures.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM pract ces n my da y work

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
0-2 years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of w ngness by c ents to adopt these pract ces

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
35-45

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Project Manager

Do you know what Bu d ng Informat on Mode ng s?
I somewhat know what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ' I do not understand the understand the funct ons, processes and capab t es of BIM.'
BIM s 3D sorftware programs

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM pract ces n my da y work

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
I don't know f the department/bus ness has adopted BIM pract ces n these t me frames.

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I am unsure whether or not BIM s advantageous or d sadvantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
F nanc a Reasons (cost of mp ement ng new systems)

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Sen or Structura Eng neer. My ro e s to carry out ana ys s and des gn of structures to ensure comp ance w th Austra an Bu d ng Standards.

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ' I do not understand the understand the funct ons, processes and capab t es of BIM.'
BIM as I understand t, s the use of a software mode wh ch captures a des gn nformat on n one p ace. A des gn nputs are ed ted n the same ve mode . The mode becomes the s ng e source of nformat on for the project.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BOM pract ces n my da y work.

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
I don't know f the department/bus ness has adopted BIM pract ces n these t me frames.

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of perce ved benef t to company/f rm

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
35-45

What company do you work for?
Aurecon & Treehouse Innovat ons

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
D g ta App cat ons Spec a st/BIM Manager - Creat on of BIM mode content, check ng for errors and ncons stenc es n project standards. Create Dynamo/Rh no scr pt ng that a ow for export of mode content to ana ys s and v sua zat on software. Used c oud app cat ons to coord nate BIM mode w th a des gn team members from other trades and demonstrate conf cts wh ch must be reso ved. Create or mod fy content to su t project needs. Set-up/ma nta n mode s to ensure speed of product on. C#/C++ cod ng to create too s to opt m ze data management. Create and own the mu t d sc p nary spat a coord nat on respons b ty for a projects.

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
Do your own research. There's enough nformat on out there. I'm not go ng to g ve you free sn ppets for someone e se to p ag ar se.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
Yes

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
Refer my ro e. I de ver fu BIM projects to FM and AM standard.

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
5+ years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
No, I wou dn't be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of w ngness by c ents to adopt these pract ces

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
D g ta Mode Manager. Organ zat on of BIM mode s w th n our company

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ' I do not understand the understand the funct ons, processes and capab t es of BIM.'
BIM s the nte gent process that a ows us to coord nate mode s from des gn to construct on and beyond. Des gn neff c enc es are dent f ed, construct on ssues are reso ved and asset management s s mp e w th a good BIM mode .

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
Yes

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I use t as I mode des gn n Rev t, usua y for the purpose of tender documentat on.

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
5+ years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of perce ved benef t to company/f rm

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
Coburn Arch tecture

What c ass f cat on does your company fa under?
Arch tecture F rm

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Arch tectura techn c an - my ro e s to ass st the arch tects n prov d ng deta ed documentat on. I a so a se w th c ents and other consu tants to ensure the f na documentat on meets the c ents requ rements and coord nate the consu tants documentat on.

Do you know what Bu d ng Informat on Mode ng s?
I somewhat know what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
BIM s a computer a ded draft ng program that s used to mode a bu d ng / project n 3D. Th s program a ows for accurate coord nat on of a the d sc p nes des gns. Th s program can ass st n prov d ng nformat on s m ar to that of a break down of mater a s requ red for the project to ensure the cost est mate s more accurate. The deve opment of a 3D mode a so ass st the c ents and user groups to v sua se and understand what they are gett ng.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
Yes

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
We use Rev t for the fo ow ng: Schemat c des gn Deve oped des gn Contract documentat on Tender documentat on As bu t draw ngs

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
0-2 years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of perce ved benef t to company/f rm

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
TMR

What c ass f cat on does your company fa under?
Other

What c ass f cat on does your company fa under? [Other]
State Government Agency

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Sen or C v Des gner Undertake the de very of road des gns us ng 3d mode ng software.

Do you know what Bu d ng Informat on Mode ng s?
I somewhat know what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ' I do not understand the understand the funct ons, processes and capab t es of BIM.'
BIM s a process where by a fu 3d mode s deve oped dur ng p ann ng and des gn, carr ed nto construct on and updated to eventua y become an assessment constructed mode wh ch can then be used for asset management purposes.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM pract ces n my da y work.

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
No

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
2-5 years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Other

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]
Genera unw ngness to adopt change.

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
TMR

What c ass f cat on does your company fa under?
Other

What c ass f cat on does your company fa under? [Other]
Government agency

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Project manager- de ver ng c v nfrastructure project rang ng from $0.5mto $30m

Do you know what Bu d ng Informat on Mode ng s?
I somewhat know what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ' I do not understand the understand the funct ons, processes and capab t es of BIM.'
The ab ty to use d fferent software to create a v rtua mode that can be used for construct on

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
'I do not use BIM pract ces n my da y work'

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
No, the company doesn't use BIM processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
The bus ness hasn't adopted BIM (Bu d ng Informat on Mode ng) pract ces n any of these t me frames.

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of w ngness by c ents to adopt these pract ces

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
SMEC

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
C v Des gner Prov d ng deta ed des gns of roads and h ghways to current des gn standards us ng 3d mode ng programs nvo v ng road geometry, dra nage des gn, serv ces and ut t es, etc to ach eve a cost effect ve, funct ona product for our c ents.

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
Bu d ng Informat on Mode ng s the comp at on of mu t p e d sc p nes com ng together to produce a ve mode that can be v ewed by the c ent and des gners as t progresses through each stage of the project.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
Yes

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
Mode s created n the program 12d can be used n BIM as a too to v ew the project. Some c ents even have BIM as a requ rement n project de very.

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
2-5 years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
Department of transport and ma n roads

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
C v eng neer

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
B m s ut zed to des gn nfrastructure and co aborate severa d fferent d sc p nes under the 1 mode . The advantage of b m s be ng ab e to v ew a structure or nfrastructure n t's ent rety and ensure serv ce c ashes etc can be avo ded or potent a construct on ssues.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not here b m pract ce n my da y work

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
No

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
I don't know f the department/bus ness has adopted BIM pract ces n these t me frames.

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Other

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]
Res stance to change w th n the organ sat on and ack or understand ng part cu ar y from o der staff where techno og ca advances care them

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
STP Consu tants

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Structura eng neer / draftsman. Des gn and documentat on of structura e ements nc ud ng res dent a and commerc a bu d ngs.

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
I understand BIM to be the deve opment of a mode us ng appropr ate software too s wh ch s then used to store and d sp ay nformat on n var ous forms such as draw ngs and 3D mode s, wh ch a ows d rect coord nat on w th other re evant BIM nks.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
Yes

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I use the Autodesk software (Rev t ma n y) n var ous forms, and the eve to wh ch I use t's fu capac ty depends on factors such as the s ze f the project and a so the fee and the c ents LOD expectat ons. Larger projects requ re more accurate mode ng and nk ng arch tectura and other eng neer ng mode s to coord nate s a b g part of that process. The ma n de verab e be ng draw ngs and shar ng the mode s w th other re evant part es.

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
5+ years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of perce ved benef t to company/f rm

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
STP Consu tants

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
BIM Manager, my ro e s to ead the use of BIM at my company. A ongs de that I am respons b e for manag ng the software, standards, support and tra n ng.

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ' I do not understand the understand the funct ons, processes and capab t es of BIM.'
BIM s a process that he ps create and manage nformat on of a bu t asset. BIM enab es a stakeho ders (arch tects, eng neers, construct on) to p an, des gn, construct and manage a bu d ng or nfrastructure throughout the fecyc e of a project, a the way to fac ty management.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
Yes

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
We use BIM for our project documentat on to p an, des gn and coord nate up unt tender/construct on documentat on.

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
0-2 years

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of w ngness by c ents to adopt these pract ces

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

Survey response 19

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
PDS De very Portfo o Lead - Hand e the day-day nterface w th h gh eve stakeho ders and respons b e for projects n the de very (construct on) space w th n QLD. Manage the month y de very of the portfo o, manag ng and ead ng the Aurecon Team to effect ve y de very projects from a cost, t me and qua ty perspect ve.

Do you know what Bu d ng Informat on Mode ng s?
Yes, I have a fu understand ng of what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
BIM s the process of ut z ng a var ety of too s and techno og es to deve op and manage a d g ta representat on of a phys ca p ace, structure or th ng. It s ut zed to test so ut ons (des gn), dent fy ssues and mp ement so ut ons pr or to the construct on. It a so ass sts w th the coord nat on between mu t p e nputs such as d fferent eng neer ng d sc p nes work ng on the same project to ass st w th coord nat on of the f na product.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM pract ces n my da y work

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
No

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
I don't know f the department/bus ness has adopted BIM pract ces n these t me frames.

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of perce ved benef t to company/f rm

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Project Manager - Work ng as a c ent s de project manager, adm n strat ng contracts and manag ng stakeho ders and contractors.

Do you know what Bu d ng Informat on Mode ng s?
I somewhat know what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
Understand that t s a way of be ng ab e to co abrat ve y manage d fferent aspects of projects through ntegrat ve des gn and mode ng

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM pract ces n my da y work

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
The bus ness hasn't adopted BIM (Bu d ng Informat on Mode ng) pract ces n any of these t me frames.

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of w ngness by c ents to adopt these pract ces

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

Survey response 21

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21

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
35-45

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Project Manager under Aurecon's contractor to Austra an Department of Defence, Estate and Infrastructure group. Estate Works Program DEWPO Project De very Serv ces (PDS). Projects are arge y bu d ng ma ntenance and susta nment.

Do you know what Bu d ng Informat on Mode ng s?
I somewhat know what t s

In your own words (100 words or ess) p ease genera y descr be what you understand about the funct on, processes and capab t es of BIM (Bu d ng Infomrat on Mode ng) and ts app cat on . If you do not know, p ease nd cate by nc ud ng the fo ow ng ‘ I do not understand the understand the funct ons, processes and capab t es of BIM.'
Some system that prov des a fu representat on of a the bu d ng fabr c, systems, equ pment and eng neer ng of a bu d ng.

Do you use BIM proccesses and/or pract ces n your pos t on on a da y bas s?
No

If you answered 'YES' to Quest on 7 p ease exp a n the capac ty n wh ch you use BIM (Bu d ng Informat on Mode ng) and for what purpose (project documentat on, des gn managment, construct on management, tender documentat on etc). If you answered 'NO' to Quest on 7 p ease answer w th the fo ow ng statement 'I do not use BIM pract ces n my da y work'
I do not use BIM pract ces n my da y work

If you don't use or haven't adopted BIM (bu d ng nformat on mode ng) n your da y ro e do you know somebody w th n (or outs de) your company/f rm who does use t.
Yes

Do you know f your company uses BIM (Bu d ng Informat on Mode ng) for project work?
Yes, I know that the company/f rm uses Bu d ng Informat on Mode ng (BIM) based processes for project work

Do you work n a department of your workp ace that has adopted BIM processes and pract ces w th n the fo ow ng t me frames?
I don't know f the department/bus ness has adopted BIM pract ces n these t me frames.

Based on your know edge of BIM pract ces, processes and capab t es do you th nk BIM can be an effect ve n manag ng construct on projects (who e fe cyc e: concept through de very) too ?
Yes

Wou d you be open to tra n ng as part of your ro e w th n ndustry to he p you ga n a better understand ng of how BIM (Bu d ng Informat on Mode ng) processes and pract ces cou d be ut sed n your ro e?
Yes, I wou d be open to tra n ng/deve opment n th s area

Wou d you cons der BIM techno ogy be ng more advantageous (than d sadvantageous) to the effect ve management of construct on projects? Th s may be based on your pract ca exper ence or even your theoret ca know edge of BIM.
Based on my know edge of the subject matter I wou d cons der BIM pract ces and processes to be advantageous n the management of projects

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y?
Lack of perce ved benef t to company/f rm

Based on your pos t on w th n the ndustry wh ch of the fo ow ng opt ons wou d you cons der the most ke y reason for your emp oyer not adopt ng BIM techno og es and pract ces more read y? [Other]

Appendix D – Questionnaire Data

Survey response 4

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
PDT Arch tects

What c ass f cat on does your company fa under?
Arch tecture F rm

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Inter or Des gner.

Do you th nk that overa BIM s used effect ve y as a construct on management too n the Austra an Industry?
Yes

Do you th nk that n the Austra an construct on ndustry that BIM s ut sed to ts fu potent a ? Whether you answered YES or NO p ease exp a n your reason ng be ow (approx. 50 - 100 words)
I don't be eve so. Its a very comp ex software p atform and compan es aren't necessar y nvest ng enough tra n ng t me for the r staff to be ab e to ut se t to ts fu est potent a .

What nterna or externa bus ness factors (e cost, ack of tra n ng, non sk ed workforce, c ent re uctance) do you th nk wou d contr bute n stopp ng a company or f rm from adopt ng BIM techno og es and pract ces? P ease answer be ow.
Cost, ack of tra n ng, ack of understand ng around t's potent a

In your company are BIM pract ces/processes used for a aspects of construct on projects, from des gn through to construct on. If not p ease exp a n be ow wh ch aspects for wh ch BIM pract ces are used n your company/f rm.
Yes they are.

Do you th nk overa BIM s an effect ve too n the management of construct on projects n Austra a? Yes or No, p ease exp a n your answer be ow.
Yes

W th n construct on (and eng neer ng/archt ecture) do you th nk there a re uctance to adopt BIM pract ces n the Austra an ndustry? Yes or No, P ease exp a n your reason ng be ow.
No, I do be eve t's a common pract ce n our ndustry today.

In genera regard ng BIM do you th nk the Austra an construct on ndustry s beh nd other ndustr a zed countr es n terms of our BIM re ated sk s and tra n ng? Yes or No, p ease exp a n your reason ng be ow.
I can't prov de comment due to ack of know edge around what's happen ng n other countr es.

What wou d you cons der the ma n advantages (and d sadvantages) of us ng BIM for the management of projects? P ease h gh ght adavantages and d sadvantages be ow.
If used eff c ent y, t saves t me and prov des accurate data.

In your v ew does the country have enough sk ed workers n th s area to adequate y tra n those that are new to BIM pract ces mov ng nto the future? P ease exp a n be ow.
Yes, I be eve so.

Do you th nk BIM has any mpact on the contractua re at onsh p between part es n the Austra an construct on/eng neer ng and arch tecture ndustry? Yes or No p ease exp a n your reas n ng be ow.
Not that I am aware of.

Survey response 5

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
PDT Arch tects

What c ass f cat on does your company fa under?
Arch tecture F rm

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Graduate of Arch tecture

Do you th nk that overa BIM s used effect ve y as a construct on management too n the Austra an Industry?
Yes

Do you th nk that n the Austra an construct on ndustry that BIM s ut sed to ts fu potent a ? Whether you answered YES or NO p ease exp a n your reason ng be ow (approx. 50 - 100 words)
No. BIM needs to be used by a consu tants on a project. A centra mode cou d be accessed by a consu tants so everyone s on the same page. However, perm ss on wou d need to be granted to work off of e ements that have changed s nce the ast forma ssue. Bu ders cou d ut ze 3D mode s more.

What nterna or externa bus ness factors (e cost, ack of tra n ng, non sk ed workforce, c ent re uctance) do you th nk wou d contr bute n stopp ng a company or f rm from adopt ng BIM techno og es and pract ces? P ease answer be ow.
Not enough fees from c ents to 3D mode the fu est potent a . Cost of a such as BIM360 s h gh.

In your company are BIM pract ces/processes used for a aspects of construct on projects, from des gn through to construct on. If not p ease exp a n be ow wh ch aspects for wh ch BIM pract ces are used n your company/f rm.
Yes

Do you th nk overa BIM s an effect ve too n the management of construct on projects n Austra a? Yes or No, p ease exp a n your answer be ow.
Yes. I th nk Austra a s qu te good at adapt ng to new techno og es

W th n construct on (and eng neer ng/archt ecture) do you th nk there a re uctance to adopt BIM pract ces n the Austra an ndustry? Yes or No, P ease exp a n your reason ng be ow.
Arch tecture, structure and shop draw ng compan es seem to be the h ghest adopters. Other serv ces such as hydrau c or e ectr ca seem more re uctant.

In genera regard ng BIM do you th nk the Austra an construct on ndustry s beh nd other ndustr a zed countr es n terms of our BIM re ated sk s and tra n ng? Yes or No, p ease exp a n your reason ng be ow.
no.

What wou d you cons der the ma n advantages (and d sadvantages) of us ng BIM for the management of projects? P ease h gh ght adavantages and d sadvantages be ow.
3D v sua sat on, c ash detect on, ntegrat on w th other mode s

In your v ew does the country have enough sk ed workers n th s area to adequate y tra n those that are new to BIM pract ces mov ng nto the future? P ease exp a n be ow.
yes. In my persona exper ence t s harder to f nd peop e sk ed n the o der 2d draft ng methods. Most educ on courses are teach ng BIM.

Do you th nk BIM has any mpact on the contractua re at onsh p between part es n the Austra an construct on/eng neer ng and arch tecture ndustry? Yes or No p ease exp a n your reas n ng be ow.
No. We have never cons dered any 3D mode s to be part of the contract documentat on. I persoan y have never had any contractua ssues that were caused by the use of BIM, ne ther have heard of t occur ng for anyone e se.

Survey response 6

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
45+

What company do you work for?
AEC connect

What c ass f cat on does your company fa under?
B m Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Owner, I run a BIM and D g ta Eng neer ng consu tancy that works w th arge asset owners, contractors, arch tects and eng neers to he p them ut se h gh end techno ogy n the des gn, de very, and operat on of the r projects/assets. I do consu t government and other nst tut ons n th s f e d, and I'm a tra ner n a th ngs re ated to strateg c BIM

Do you th nk that overa BIM s used effect ve y as a construct on management too n the Austra an Industry?
Yes

Do you th nk that n the Austra an construct on ndustry that BIM s ut sed to ts fu potent a ? Whether you answered YES or NO p ease exp a n your reason ng be ow (approx. 50 - 100 words)
Of course not. Nobody knows what the fu potent a wou d mean. Everyone has d fferent needs, everyone has d fferent sk eve s. In a way, that quest on does not make much sense. A so, t s mportant to know that BIM sn't stat c. It s constant y evo v ng and expand ng nto d fferent areas. Us ng t to ts fu potent a wou d pose excess ve r sk to those engaged as they'd a ways have to change the r de very approach. The ndustry cou d not cope w th th s fast change.

What nterna or externa bus ness factors (e cost, ack of tra n ng, non sk ed workforce, c ent re uctance) do you th nk wou d contr bute n stopp ng a company or f rm from adopt ng BIM techno og es and pract ces? P ease answer be ow.
F rst and foremost the success of BIM depends on the understand ng by upper management of how BIM and D g ta Eng neer ng can nf uence the r core bus ness. It s st m sunderstood by many eaders as a techn ca add-on. Next to that, unc ear (or ack ng) requ rements from the c ent s de certa n y make t hard for the supp y cha n to f ne-tune the r offer ngs/efforts n the BIM space towards targeted outputs. Cost, or techno ogy aren't the prob em. Sk eve s - to a degree

In your company are BIM pract ces/processes used for a aspects of construct on projects, from des gn through to construct on. If not p ease exp a n be ow wh ch aspects for wh ch BIM pract ces are used n your company/f rm.
Yes

Do you th nk overa BIM s an effect ve too n the management of construct on projects n Austra a? Yes or No, p ease exp a n your answer be ow.
You've asked that quest on before.... BIM s not a too , but a process... that process, f app ed purposefu y, offers very effect ve means of project de very. It certa n y depends on a number of factors to ach eve th s.

W th n construct on (and eng neer ng/archt ecture) do you th nk there a re uctance to adopt BIM pract ces n the Austra an ndustry? Yes or No, P ease exp a n your reason ng be ow.
Those who work on sma sca e projects that can eas er and qu cker be dea t w th, w thout the nformat on/data-management over ay assoc ated to BIM. A so those who are not nterested n the fecyc e of the r projects and s mp y p an to procure, bu t and se assets (accord ng to a repeat ng formu a) as a means of mak ng money.

In genera regard ng BIM do you th nk the Austra an construct on ndustry s beh nd other ndustr a zed countr es n terms of our BIM re ated sk s and tra n ng? Yes or No, p ease exp a n your reason ng be ow.
No, there are certa n areas where we are wor d- ead ng, and others (e.g. po cy) where we are beh nd.

What wou d you cons der the ma n advantages (and d sadvantages) of us ng BIM for the management of projects? P ease h gh ght adavantages and d sadvantages be ow.
D sadvantages: H gher need for data management (wh ch many aren't used to) n construct on, H gher upfront-cost for software/hardware/tra n ng, H gher nterdependenc es of part c pat ng part es on projects (wh ch can a so be a good th ng) Advantages: More effect ve project management, more standard sed datasets that can a so be nked to asset management, ncreased env ronmenta susta nab ty w th h gher accountab ty about mater a s used and the r carbon footpr nt. etc... the st s ong

In your v ew does the country have enough sk ed workers n th s area to adequate y tra n those that are new to BIM pract ces mov ng nto the future? P ease exp a n be ow.
Not rea y, the prob em sn't the software tra n ng for BIM mode ng and coord nat on, but the tra n ng for m d and upper management to engage w th the BIM process. Industry bod es shou d do more and a so co aborate n order to do just ce to the ho st c BIM approach (and assoc ated sk s) that's needed out n the ndustry.

Do you th nk BIM has any mpact on the contractua re at onsh p between part es n the Austra an construct on/eng neer ng and arch tecture ndustry? Yes or No p ease exp a n your reas n ng be ow.
Yes, of course t has. For exp anat on read my paper...: https://www.researchgate.net/pub cat on/282707444_Reth nk ng_the_contractua _context_for_Bu d ng_Informat on_Mode ng_BIM_ n_the_Austra an_bu t_env ronment_ ndustry

Survey response 7

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7

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Question Group 1 of 1 - Building Information Modelling in Australia

What company do you work for?

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.

Do you th nk that n the Austra an construct on ndustry that BIM s ut sed to ts fu potent a ? Whether you answered YES or NO p ease exp a n your reason ng be ow (approx. 50 - 100 words)

What nterna or externa bus ness factors (e cost, ack of tra n ng, non sk ed workforce, c ent re uctance) do you th nk wou d contr bute n stopp ng a company or f rm from adopt ng BIM techno og es and pract ces? P ease answer be ow.

In your company are BIM pract ces/processes used for a aspects of construct on projects, from des gn through to construct on. If not p ease exp a n be ow wh ch aspects for wh ch BIM pract ces are used n your company/f rm.

Do you th nk overa BIM s an effect ve too n the management of construct on projects n Austra a? Yes or No, p ease exp a n your answer be ow.

W th n construct on (and eng neer ng/archt ecture) do you th nk there a re uctance to adopt BIM pract ces n the Austra an ndustry? Yes or No, P ease exp a n your reason ng be ow.

In genera regard ng BIM do you th nk the Austra an construct on ndustry s beh nd other ndustr a zed countr es n terms of our BIM re ated sk s and tra n ng? Yes or No, p ease exp a n your reason ng be ow.

What wou d you cons der the ma n advantages (and d sadvantages) of us ng BIM for the management of projects? P ease h gh ght adavantages and d sadvantages be ow.

In your v ew does the country have enough sk ed workers n th s area to adequate y tra n those that are new to BIM pract ces mov ng nto the future? P ease exp a n be ow.

Do you th nk BIM has any mpact on the contractua re at onsh p between part es n the Austra an construct on/eng neer ng and arch tecture ndustry? Yes or No p ease exp a n your reas n ng be ow.

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
D g ta Mode Manager - I coord nate BIM mode s com ng n and go ng out of our off ce

Do you th nk that overa BIM s used effect ve y as a construct on management too n the Austra an Industry?
Yes

Do you th nk that n the Austra an construct on ndustry that BIM s ut sed to ts fu potent a ? Whether you answered YES or NO p ease exp a n your reason ng be ow (approx. 50 - 100 words)
No - th s s a genera assessment of what I have seen across d fferent f rms and d sc p nes. A though BIM processes are effect ve, t s not cost eff c ent on sma er projects where c ents do not need n depth funct ona t es. It comes nto ts own on arger projects where fu we can use these processes to ts fu capac ty

What nterna or externa bus ness factors (e cost, ack of tra n ng, non sk ed workforce, c ent re uctance) do you th nk wou d contr bute n stopp ng a company or f rm from adopt ng BIM techno og es and pract ces? P ease answer be ow.
S mp y, money. If t s not 'seen' as a cost effect ve n t at ve on projects then t wont get used

In your company are BIM pract ces/processes used for a aspects of construct on projects, from des gn through to construct on. If not p ease exp a n be ow wh ch aspects for wh ch BIM pract ces are used n your company/f rm.
We use most processes effect ve y.

Do you th nk overa BIM s an effect ve too n the management of construct on projects n Austra a? Yes or No, p ease exp a n your answer be ow.
Yes, t can he p you coord nate the fe of a project

W th n construct on (and eng neer ng/archt ecture) do you th nk there a re uctance to adopt BIM pract ces n the Austra an ndustry? Yes or No, P ease exp a n your reason ng be ow.
Yes, on sma er projects, due to monetary reasons sted above

In genera regard ng BIM do you th nk the Austra an construct on ndustry s beh nd other ndustr a zed countr es n terms of our BIM re ated sk s and tra n ng? Yes or No, p ease exp a n your reason ng be ow.
I'm not too sure, I don't fo ow t on a g oba eve

What wou d you cons der the ma n advantages (and d sadvantages) of us ng BIM for the management of projects? P ease h gh ght adavantages and d sadvantages be ow.
It prov des better co aborat on between d sc p nes a ow ng for greater coord nat on and c ash detect on

In your v ew does the country have enough sk ed workers n th s area to adequate y tra n those that are new to BIM pract ces mov ng nto the future? P ease exp a n be ow.

Do you th nk BIM has any mpact on the contractua re at onsh p between part es n the Austra an construct on/eng neer ng and arch tecture ndustry? Yes or No p ease exp a n your reas n ng be ow.

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Question Group 1 of 1 - Building Information Modelling in Australia

What company do you work for?

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.

Do you th nk that n the Austra an construct on ndustry that BIM s ut sed to ts fu potent a ? Whether you answered YES or NO p ease exp a n your reason ng be ow (approx. 50 - 100 words)

What nterna or externa bus ness factors (e cost, ack of tra n ng, non sk ed workforce, c ent re uctance) do you th nk wou d contr bute n stopp ng a company or f rm from adopt ng BIM techno og es and pract ces? P ease answer be ow.

In your company are BIM pract ces/processes used for a aspects of construct on projects, from des gn through to construct on. If not p ease exp a n be ow wh ch aspects for wh ch BIM pract ces are used n your company/f rm.

Do you th nk overa BIM s an effect ve too n the management of construct on projects n Austra a? Yes or No, p ease exp a n your answer be ow.

W th n construct on (and eng neer ng/archt ecture) do you th nk there a re uctance to adopt BIM pract ces n the Austra an ndustry? Yes or No, P ease exp a n your reason ng be ow.

In genera regard ng BIM do you th nk the Austra an construct on ndustry s beh nd other ndustr a zed countr es n terms of our BIM re ated sk s and tra n ng? Yes or No, p ease exp a n your reason ng be ow.

What wou d you cons der the ma n advantages (and d sadvantages) of us ng BIM for the management of projects? P ease h gh ght adavantages and d sadvantages be ow.

In your v ew does the country have enough sk ed workers n th s area to adequate y tra n those that are new to BIM pract ces mov ng nto the future? P ease exp a n be ow.

Do you th nk BIM has any mpact on the contractua re at onsh p between part es n the Austra an construct on/eng neer ng and arch tecture ndustry? Yes or No p ease exp a n your reas n ng be ow.

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
Aurecon

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
Project Manager - manage des gn and construct on aspects of construct on n consu tancy env ronment

Do you th nk that overa BIM s used effect ve y as a construct on management too n the Austra an Industry?
Yes

Do you th nk that n the Austra an construct on ndustry that BIM s ut sed to ts fu potent a ? Whether you answered YES or NO p ease exp a n your reason ng be ow (approx. 50 - 100 words)
Be ng n a pos t on that I don't frequent y use BIM however understand ts potent a and ts capab t es, I gather that from my exper ences that BIM when used sn't ut zed to ts fu potent a . It s often used for ts 3D documentat on capab t es, for c ash detect on and des gn etc but s often not used beyond th s po nt. I be eve that us ng t for areas ke documentat on, cost ng, hea th and safety and un ock ng ts fu potent a wou d better benef t projects.

What nterna or externa bus ness factors (e cost, ack of tra n ng, non sk ed workforce, c ent re uctance) do you th nk wou d contr bute n stopp ng a company or f rm from adopt ng BIM techno og es and pract ces? P ease answer be ow.
My exper ence n ndustry suggest that ack of a fu y sk ed workforce n th s area may be an ssue n stopp ng compan es from tak ng on BIMS fu capab t es and nvest ng n techno og es and process wh ch wou d be benef c a n management of projects.

In your company are BIM pract ces/processes used for a aspects of construct on projects, from des gn through to construct on. If not p ease exp a n be ow wh ch aspects for wh ch BIM pract ces are used n your company/f rm.
I work n a consu tancy and understand that Bu d ng and nfrastructure teams use BIM n the r des gn work. Th s nformat on s then used to a d n construct on, however I be eve th s s m ted and a number of factors nc ud ng w ngness of c ents to fu y embrace a aspects of BIM ho ds back the potent a to rea y ut ze these pract ces, processes and software to the r fu potent a .

Do you th nk overa BIM s an effect ve too n the management of construct on projects n Austra a? Yes or No, p ease exp a n your answer be ow.
Yes, t has the ab ty to mprove des gn for examp e serv ces c ash detect on etc. I be eve f used effect ve y t cou d a so he p w th aspects of project documentat on and project cost ng as we .

W th n construct on (and eng neer ng/archt ecture) do you th nk there a re uctance to adopt BIM pract ces n the Austra an ndustry? Yes or No, P ease exp a n your reason ng be ow.
I th nk th s s subject ve, the s ze of the bus ness wou d mpact, the ab ty of staff and a so a eve of usher ng n techno ogy nto a bus ness that sn't w ng to undertake the t me and effort n nvest ng and us ng BIM

In genera regard ng BIM do you th nk the Austra an construct on ndustry s beh nd other ndustr a zed countr es n terms of our BIM re ated sk s and tra n ng? Yes or No, p ease exp a n your reason ng be ow.
W th exper ence on y n Austra a th s s d ff cu t to say, however there doesn't seem to be a preva ence of use throughout the ndustry.

What wou d you cons der the ma n advantages (and d sadvantages) of us ng BIM for the management of projects? P ease h gh ght adavantages and d sadvantages be ow.
Advantages nc ude - more co abrat ve des gn, ess rework, easy to manage number of d fferent d sp nces, can be used to he p w th cost est mat ng, he p w th deve op ng construab ty p ann ng and methodo ogy deve opment. D sadvantages - can be d ff cu t f not sk ed n how BIM software, pract ces and processes work, Not a ways someth ng that c ents ut ze or are w ng to part c pate n.

In your v ew does the country have enough sk ed workers n th s area to adequate y tra n those that are new to BIM pract ces mov ng nto the future? P ease exp a n be ow.
From my perspect ve, no. Th s s the percept on that I get however not work ng d rect y n a bus ness where work exc us ve y revo ves around us ng BIM t s hard to say.

Do you th nk BIM has any mpact on the contractua re at onsh p between part es n the Austra an construct on/eng neer ng and arch tecture ndustry? Yes or No p ease exp a n your reas n ng be ow.
Yes, I be eve that a better managed project n genera wou d have a pos t ve mpact on the contractura part es on projects. Less error and rework/om ss ons means ess potent a for contractura ssues. Th s s ev dent as a project manager that understands the mportance of th s re at onsh p w th contractors and stakeho ders, anyth ng that may mprove th s can have an mpact.

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Question Group 1 of 1 - Building Information Modelling in Australia

What s your age range?
25-35

What company do you work for?
Department or transport and ma n roads

What c ass f cat on does your company fa under?
Eng neer ng Consu tancy

What c ass f cat on does your company fa under? [Other]

What s your current job t t e? P ease exp a n your ro e n 50 words or ess.
C v des gner

Do you th nk that overa BIM s used effect ve y as a construct on management too n the Austra an Industry?
No

Do you th nk that n the Austra an construct on ndustry that BIM s ut sed to ts fu potent a ? Whether you answered YES or NO p ease exp a n your reason ng be ow (approx. 50 - 100 words)
No, as th s s not someth ng wh ch s yet enforced st ngent y by c ents and current y due to the ack of tra n ng and ndustry exper ence b m s current y seen as an added extra w th add t ona s gn f cant costs.

What nterna or externa bus ness factors (e cost, ack of tra n ng, non sk ed workforce, c ent re uctance) do you th nk wou d contr bute n stopp ng a company or f rm from adopt ng BIM techno og es and pract ces? P ease answer be ow.
Lack of tra n ng n the eng neer ng ndustry w th a current y nfrastructure boom n transport des gn ndustry means speed of de very s essent a . Upcom ng pract ses are not be ng adopted as qu ck y as ack of t me doesn't accommodate new earn ng. Cost s a factor to eng neer ng f rms add t ona y.

In your company are BIM pract ces/processes used for a aspects of construct on projects, from des gn through to construct on. If not p ease exp a n be ow wh ch aspects for wh ch BIM pract ces are used n your company/f rm.
B m s hard y ut sed current y w th n TMR as de from arge projects n the hundreds of m ons n do ar va ue wh ch are genera y undertaken under a D&C project mode .

Do you th nk overa BIM s an effect ve too n the management of construct on projects n Austra a? Yes or No, p ease exp a n your answer be ow.
At the moment BIM s under ut zed w th n Austra a for what t s capab e of do ng.

W th n construct on (and eng neer ng/archt ecture) do you th nk there a re uctance to adopt BIM pract ces n the Austra an ndustry? Yes or No, P ease exp a n your reason ng be ow.
Yes. There s re uctance w th n the ndustry due to ack of know edge and understand ng of BIM funct ona ty and how d ff cu t t s to use.

In genera regard ng BIM do you th nk the Austra an construct on ndustry s beh nd other ndustr a zed countr es n terms of our BIM re ated sk s and tra n ng? Yes or No, p ease exp a n your reason ng be ow.
Yes, other countr es are more advanced n BIM mode ng and t s ev dent we are not keep ng up w th the techno ogy ava ab e.

What wou d you cons der the ma n advantages (and d sadvantages) of us ng BIM for the management of projects? P ease h gh ght adavantages and d sadvantages be ow.
The ma n advantages are understand ng how a project w f t nto the a ocated space. G ve too s for pub c consu tat on, quant ty est mat on and understand ng and c ashes w th serv ces and pub c ut ty etc. D sadvantages cou d be ack of be ng ab e to show rev s ons between des gn adjustments n construct on eas y as trad t on p ans w th rev s on c ouds.

In your v ew does the country have enough sk ed workers n th s area to adequate y tra n those that are new to BIM pract ces mov ng nto the future? P ease exp a n be ow.
No, current y there s not enough sk ed to tra n others however many who w th n the des gn ndustry have a good sk set w th computer programs and wou d ke y p ck up sk s w th t me on the job.

Do you th nk BIM has any mpact on the contractua re at onsh p between part es n the Austra an construct on/eng neer ng and arch tecture ndustry? Yes or No p ease exp a n your reas n ng be ow.
Yes, Potent a y BIM cou d have a huge mpact on the ndustry w th advantages to a facets of the ndustry n that mode s are eas er to nterpret etc.

Appendix E – USQ Human Ethics Committee Approval

Adrian Nowak

From: Adrian Nowak <u1035214@umail.usq.edu.au>
Sent: Friday, 23 October 2020 6:29 AM
To: Adrian Nowak
Subject: Fwd: [RIMS] USQ HRE Application - H20REA223 - Expedited review outcome -Approved

---------- Forwarded message ---------
From: <human.Ethics@usq.edu.au>
Date: Tue, Sep 8, 2020 at 9:35 AM
Subject: [RIMS] USQ HRE Application - H20REA223 - Expedited review outcome -Approved
To: <U1035214@umail.usq.edu.au>
Cc: <Amirhossein.Heravi@usq.edu.au>

Dear Adrian

I am pleased to confirm your Human Research Ethics (HRE) application has now been reviewed by the University's Expedited Review process. As your research proposal has been deemed to meet the requirements of the National Statement on Ethical Conduct in Human Research (2007),
ethical approval is granted as follows:

USQ HREC ID: H20REA223
Project title: Building information Modelling and its adoption and effectiveness as a tool in the management of construction projects in Australia
Approval date: 08/09/2020
Expiry date: 08/09/2023
USQ HREC status: Approved

The standard conditions of this approval are:

a) responsibly conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal;.

(b) advise the University (email:ResearchIntegrity@usq.edu.au) immediately of any complaint pertaining to the conduct of the research or any other issues in relation to the project which may warrant review of the ethical approval of the project;

(c) promptly report any adverse events or unexpected outcomes to the University (email: ResearchIntegrity@usq.edu.au) and take prompt action to deal with any unexpected risks;

(d) make submission for any amendments to the project and obtain approval prior to implementing such changes;

(e) provide a progress 'milestone report' when requested and at least for every year of approval.

(f) provide a final 'milestone report' when the project is complete;

(g) promptly advise the University if the project has been discontinued, using a final 'milestone report'.

The additional conditionals of approval for this project are:

(a) Nil.

Please note that failure to comply with the conditions of this approval or requirements of the Australian Code for the Responsible Conduct of Research, 2018, and the National Statement on Ethical Conduct in Human Research, 2007 may result in withdrawal of approval for the project.
Congratulations on your ethical approval! Wishing you all the best for success!

If you have any questions or concerns, please don't hesitate to make contact with an Ethics Officer.

Kind regards

Human Research Ethics

University of Southern Queensland
Toowoomba – Queensland – 4350 – Australia
Phone: (07) 4631 2690
Email: human.ethics@usq.edu.au
