THE INVESTIGATION OF A POTENTIAL VALUE OF A PROJECT MANAGEMENT INFORMATION MODELLING SYSTEM FOR BUILDING AND CONSTRUCTION PROJECTS IN AUSTRALIA.

This Thesis presented by

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for the award of

Doctor of Business Administration (DBAR)

2021

Abstract

The intention of this research is to investigate and identify deficiencies in today's use Information Modelling (IM) systems in construction projects in Australia and ascertain whether there is a possibility for the development, adoption, and implementation of a broader-based project management information modelling system (PMIMS) to provide better project outcomes. The study focuses on Information Modelling (IM) systems currently used within project management aspects of construction projects in Australia. The research then provides recommendations on the issues to be considered to improve the viability of such a PMIMS for building and construction projects in Australia. A PMIMS may have the potential to provide enhanced project management in the building and construction sector in Australia across many aspects of projects.

The building and construction sector are faced with a myriad of challenges concerning project management, including those challenges associated with the adoption of general information modelling systems used in the project management fraternity, such as inefficiencies, conflict, inaccuracies in documentation, never-ending changes to scope, poor documentation, inappropriate project outcomes, and financial and economic losses across the entire life span of projects. Project management practitioners interviewed in this study indicate that the formulation and adoption of a PMIMS may be key contributors towards better project outcomes in the construction and building sector in Australia. Probability sampling technique, where an equal opportunity exists for all the members in a population to be chosen and be agent of the complete population was employed for this research project.

This research project adopts a qualitative approach to explore this potential for the expanded use of IM systems on project management practices.

The findings of this research study highlight the potential development and application of a PMIMS structure tailor-made for Australian construction firms, as well as the adoption of a PMIMS by Australian project managers.

Overall, the value of study is its contribution for project management in relation to the use of information modelling systems, and identification of and guidelines for the possible development of such a PMIMS for the Australian construction sector.

THESIS CERTIFICATION

The entire work is solely the work of Agrippa Chifeya. Furthermore, this work has not formerly been presented to any honor, apart from where accepted.

Principle Supervisor
Associate Professor David Thorpe

Associate Supervisor
Doctor Subrata Chakraborty

The signatures of endorsement for both student and supervisors' signatures of endorsement are held at the University.

Acknowledgements

If I look back about three years ago to the time when I started this doctorate, I never thought I could complete such an extensive research project. Candidly speaking, it was not easy for me to undertake this doctorate. Primarily, I want to thank our God Almighty for enabling me to write this dissertation and for giving me power and endurance in epochs of despair. Furthermore, I want to thank my wife Grace, and my children, Audrey, Kimberly, Theophilus and Shayne for their understanding when I was depriving them of my special time with them whilst doing this doctorate degree.

I also want to thank my initial supervisor, Associate Professor Barrie Todhunter for guiding me through this and helping me understand my own self when I was starting this doctorate. Notwithstanding his unquestioned expertise in this field, he was always open to share with me and proved this outstanding expertise in the project management fraternity. One of his abilities was to be able to create an atmosphere of trust and to inspire me through his way of communicating through emails, even when I felt that I was lagging. His intellectual capacity in project management always enabled him to provide constructive feedback to me which he always presented in a friendly manner.

I also want to acknowledge the subsequent supervisor, Associate Professor David Thorpe for taking me through the rest of the journey from ethics approval until the time I completed this research project. Whenever I had doubts about any particular weakness in this doctorate thesis, I could be sure that he had already identified it, and he could give me valued feedback in which he never hesitated to challenge my thoughts and provide very useful information. I reminisce it was one meeting after another trying to come up with a flawless solution for this doctoral thesis. I would similarly recognise and thank Dr Subrata Chakraborty for helping me through as well through this journey.

Furthermore, a special thanks goes to the staff and management of University of Southern Queensland for providing me the entire right infrastructure, and all the resources essential for this dissertation, and the opportunity to spend three years under the right infrastructure and resourceful milieu.

This research has been indeed buoyed by the Australian Government Research Training Program Scholarship.

Finally, I would want to thank all project managers who participated in interviews and managed to help me come up with a sound dissertation.

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Glossary of terms

AEC – Architecture Engineering and Construction

BEEM - Building Energy and Environment Modelling

BEM- Building Environment Modelling

BIM-Building Information Modelling

BPM – Building Performance Modelling CAD- Computer Aided DesignCFS – Critical Success Factors

CPTED - Crime Prevention Through Environmental Design

DBAR - Doctor of Business Administration Research

HBIM- Historic Building Information Modelling

ICT - Information and Communications Technology

IM - Information Modelling

KMO – Kaiser Meyer Olkin

MEP - Mechanical, Electrical and Plumbing

PMIS - Project Management Information System

PMIM – Project Management Information Modelling

PMIMS – Project Management Information Modelling System

ROI - Return on Investment

SD – System Dynamics

SME - Small to Medium Enterprises

USQ - University of Southern Queensland

CHAPTER 1: INTRODUCTION

1.1 Introduction and background

This research project investigates a possible emerging disruption in the construction and building sectors from the perceived slow uptake of comprehensive information modelling (IM) in project management practices (Ghaffarianhoseini et al. 2017). Current IM systems are intended to assist mostly in construction phases, in the design of building and construction projects, and to help create a collaborative process involving the project team, owners, contractors, and designers during those phases (Ghaffarianhoseini et al. 2017). However, they do not extend to all possible phases or stages of construction project life cycles which could have a lifespan of 50 to 100 years if operational and disposal stages are considered (Love et al. 2014). This study explores that concept of a broader application of information modelling in the construction projects in the context of an extended life cycle of building and construction projects.

This study briefly examines the existence and use of more basic existing information systems commonly referred to as project management information systems (PMISs) (Govan and Berisha 2016). The literature suggests that these are more passive systems used to manage information related to managing projects, rather than integrated systems used to determine project outcomes (Govan and Berisha 2016).

Existing information modelling (IM) systems that are considered in the literature review stage of this research project include Building Information Modelling (BIM), Building Environment Modelling (BEM), Building Energy Modelling (BEM) and Building Performance Modelling (BPM) (Ghaffarianhoseini et al. 2017). Building Information Modelling (BIM) is the extensively used IM system in the building and construction sector at the moment, that it is being increasingly adopted for the documentation and construction phases of a broader range of projects and is becoming a mandated requirement for certain projects in overseas several countries (Love et al. 2014). Conferring to Love et al. (2014) , Australia is lagging behind other countries in the mandated adoption of IM systems in the construction sector.

In spite of the increasing adoption of IM systems in the building and construction industries, there are still however significant project failures, and this research project looks at whether a comprehensive IM system for use by project managers might help to reduce that failure level

(Ghaffarianhoseini et al. 2017). As part of this study, an exploration of the extent of use of IM systems by project managers in their organisations for building and construction projects suggests there may be ways of expanding such systems across the project life cycle so as to reduce failure levels.

This study explores whether upstream and/or downstream migration of IM systems into all phases of the management of project life cycles might provide outcomes by which project sponsors can better identify and define their needs and requirements prior to commitment of significant financial resources.

The literature review suggests that there has been a communication fissure in the design and delivery processes used by project sponsors, project managers, design consultants, contractors, and other team members in construction projects and that this has led to considerable inefficiencies within the industry (Ghaffarianhoseini et al. 2017). A review of the literature also reveals that the implementation of Information Modelling (IM) systems in building and construction projects in Australia lags behind by up to around twenty per cent when compared with implementation of similar systems in other developed countries (Govan and Berisha 2012). Conversely, the building and construction sectors in Australia remain key productive sectors, and hence the need to incorporate contemporary technologies in this area has strong support (Love et al. 2014).

The rationale is that successful implementation of new systems in the sector cuts down on unnecessary production costs, time and quality, thereby improving efficiency at both the micro and macro-economic levels in Australia (Govan and Berisha 2012).

In summing up, this study seeks to investigate and identify ways in which current Information Modelling (IM) systems can be and extended to provide improved project outcomes in the construction projects in Australia.

This research project adopts an appropriate qualitative approach to explore this potential for the expanded use of IM systems on project management practices, and to identify key issues to be considered for the possible development of a framework for a PMIMS for building and construction projects.

1.2 Research problem and research objectives

1.2.1 Research objectives

To address this question, the current research study is guided by the following research objectives:

1. To investigate, identify deficiencies in the current Information Modelling (IM) systems and ascertain whether there is a possibility for a recommendation for the adoption and implementation of a project management information modelling system PMIMS to provide better project outcomes in the construction projects in Australia.
2. To ascertain the magnitude of and use of IM systems in the project management sector in the context of building and construction projects in Australia.
3. To determine how the IM systems are currently viewed in the project management sector in the context of building and construction projects in Australia.

1.3.2 Research problem and research question

Anecdotal evidence and preliminary literature reviews carried out during the initial stage of this research study have suggested that the building and construction industry experiences issues such as inefficiencies, conflict, inaccuracies in documentation, never-ending changes to scope, poor documentation, inappropriate project outcomes, and financial and economic losses across the entire life span of projects. Increasing adoption of technology has seen improvements over recent decades but the industry is not seen to be as efficient as other industries that may be regarded as more mature, such as the aviation industry and the motor vehicle industry.

This *research problem* that is the focus on this study may be stated as:

> *The building and construction industry in Australia are perceived to be inefficient and ineffective and that the increased integration of technology across all facets of project management may lead to improvements in efficiency and effectiveness.*

The research problem is above, which then leads into the overarching research question

indicated below to be answered by this study. That question is broken down into sub-questions to guide how the study has been undertaken.

The main research question can be stated as:

Can project managers better utilise information modelling systems to achieve better project outcomes across the complete life cycle of building and construction projects in Australia"?

To achieve the research objectives, the researcher will be steered by the following sub-questions:

1. What IM systems are currently used in the project management sector in the context of building and construction projects in Australia?
2. What are the issues for consideration in the design, development, and adoption of a possible PMIMS for the Australian building and construction sector?
3. What are the benefits of having functional PMIMs?
4. which actions should be done for Australia wide usage of PMIM?

1.3 Outline of the chapters.

This chapter outlines the general contextual of the research project and its intentions. It articulates the broad research problem that the research project endeavors to address and breaks down that problem into an overarching research question, together with a series of sub-questions that, when answered, will collectively lead to a justifiable solution to the research question.

The second chapter gives a literature review and describes the techniques used to identify literature in the relevant domains from a range of sources. Topics that are explored include:

- The building and construction sector in Australia including project life cycles to be managed.
- The project management discipline within the building and construction sector
- Simple information systems currently used in managing projects (referred to as a PMIS)
- Information modelling (IM) systems currently used in project management and the building and construction sector.

As the initial literature review identified it as a significant technology in the building and construction sector, Chapter 2 also examines in more depth the widespread adoption and utilization of BIM in the construction sector, its implementation benefits, the challenges and associated costs. The literature review suggests that BIM may be an appropriate foundation for a more broadly-based PMIMS. Lastly, in chapter 2, the research provides an analytical framework which helps to define the research problem for this study.

Chapter 3 illustrates the research methodology that was employed throughout the research to solve the research problem, which consecutively leads to the results, conclusions and recommendations contained in the later chapters. The discussion provides justification for the design of the research, selection of the key stakeholders involved in data collection and the instruments and processes used in data collection. Chapter 3 also considers data reliability and how the data was validated. Chapter 3 provides details of how primary data for this research was collected from the structured interviews administered to selected project managers of nominated organisation's in the building and construction sector in Australia, and how the data from the interviews was analysed. Data from the structured interviews were analysed.

Chapter 4 presents the findings of the data analysis and the conclusions that were drawn during interviews.

Chapter 5 outlines the discussions that happed and the findings that were found in the focus group discussion.

A summary of the conclusions that were drawn, their limitations, and suggestions for the potential design, adoption, and implementation of a PMIMS by Australian construction companies are outlined in Chapter 6.

At the end of the report is a list of all references used during this study, and appendices which help to support the research project methodology and the research outcomes.

1.4 The research roadmap

A diagrammatic illustration of the research study process is provided in figure 1, and summarises how the research process was conducted and the way this study addressed each of the research questions to come up with answers to the research problem.

This roadmap of the research project as shown in Figure 1, was initially developed to provide a framework for identifying the sequential steps necessary to carry out the project:

- Stage 1: During this stage, the researcher conducted a preliminary study research.
- Stage 2: A review of the literature to identify and understand of the body of knowledge that already exists in the project management domain of building and construction projects.
- Stage 3: Data collection through interviews for exploration of the current utilisation of information modelling systems in building and construction projects
- Stage 4: Stage four comprised of data analysis of the collected data from the interviews.
- Stage 5: Focus group discussions were conducted to verify the results obtained from the interviews.
- Stage 6: This stage involved writing up the dissertation to illustrate the findings from the research.

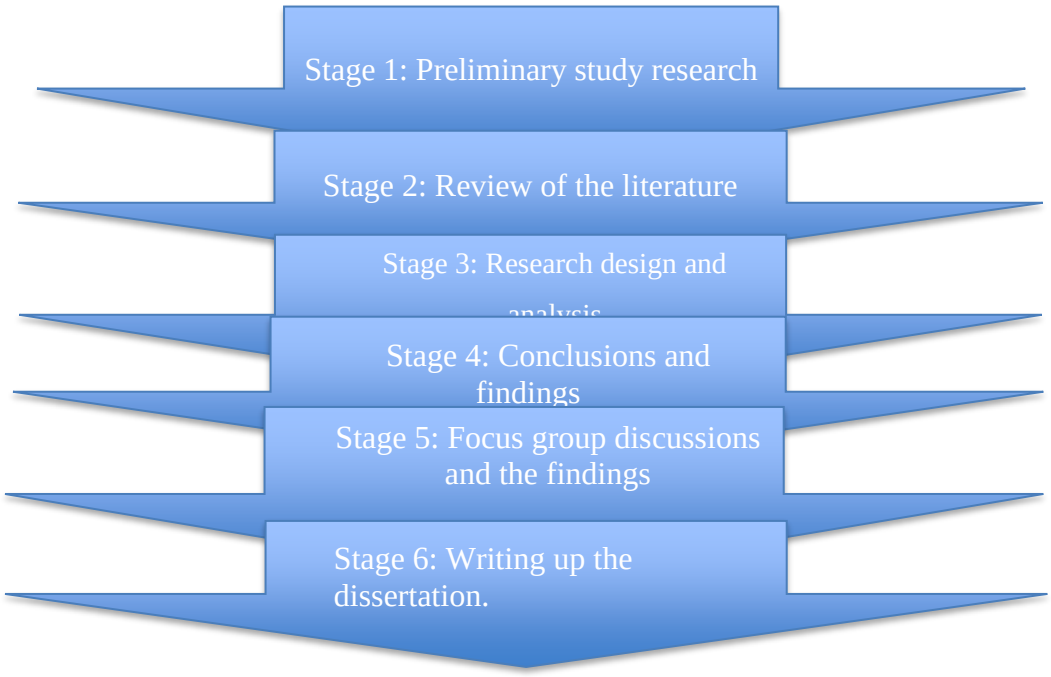

Figure 1: Roadmap of research project

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Chapter 1 has given a concise outline of the points of this examination undertaking and set out an away from of the exploration issue to be tended to, the overarching research question to guide the undertaking of this study, and a series of sub-questions, the answers to which will collectively answer the main research question.

This chapter will examine the literature that summarises the known body of knowledge related to the research questions. To do that, it will briefly examine the context of the study related to the building and construction industry, and to the discipline of project management. It will then explore in more detail the literature related to the technologies utilized in the building and construction industry and the project management discipline.

The deductions from the literature review will guide the exploration of the current use of information modelling systems in the project management sector and identification of issues to be considered in the development and adoption of a PMIMS.

The literature review below examines the existing literature in the information systems used in managing projects in the construction sector in Australia to identify the existing bodies of knowledge. Gaps are then identified to frame the research project more clearly, and to select an appropriate methodology used to collect data and to analyses it. Domains to be explored include:

- Building and construction industry in Australia
- Project management of building and construction projects in Australia
- Existing information systems and modelling systems used in the management of building and construction industry projects in Australia.

2.2 Building and construction industry in Australia

According to Love et al. (2014), over 90 per cent of Australian firms in the building and construction sector are small to medium firms with fewer than four employees. Small firms to medium worldwide have a propensity for being reluctant with regards to selection and usage of

new innovations and modern-day efficiency oriented business processes (Love et al. 2014).

The significance of this sector is pointed out by Poirier et al. (2015) who clearly reveals the large size of this area in Australia as evidenced by the number of firms in the sector, the majority of which are Small to Medium Enterprises(SMEs)

Building and construction firms Australia are mainly faced with an increase in unexpected problems and disruptions during the construction phases, and this is leading to overruns in terms of the time and cost of the projects (Chan 2016).

According to Palos (2012), most Australian construction firms are failing to maximize their potential due to slow economic growth, high competition, and this has led to a strong continuous pressure on them leading to low productivity and performance in the industry. Ali (2017) says that most project managers are faced with a myriad of problems when delivering projects in such environment leading to loses on projects and continuous low-key performance indicators (KPIs).

According to Stewart (2015), there is an incredible requirement for the building and construction firms to embrace new technology and development as there has been a general slow pace when it comes to building and construction. The slow uptake and effective use of these technologies, especially information and technology based has led to ineffective project delivery (Stewart 2017).

Rogers et al. (2015a) has suggested that small firms within the building and construction sector in Australia are slow to innovate and are faced with a myriad of barriers to innovativeness. According to Rogers et al. (2015a) these barriers include a shortage of the requisite knowledge and resources as well as skilled personnel.

In the view of (Rogers et al. 2015a), there is an existing misconception that only large building and construction firms possess the requisite levels of skills and resources needed for the successful adoption and implementation of IM systems and related technologies. Yet, projects delivered by small Australian building and construction can be significantly more benefitted than their larger counterparts by taking advantage of Information Modelling systems (IMs) (Arayici et al 2016). Crucial findings by Palos (2017) reveals that contractors in the construction sectors lag behind, architects and designers in adopting and implementing IMs.

Also, it was established that key drivers towards IM adoption and implementation were centered on the IM's ability to reduce the magnitude of both errors and clashes as well as reducing excessive reworks on projects (Arayici et al 2016).

2.3 Project management of building and construction projects.

2.3.1 Definition of a project.

The term project can be portrayed in various manners. Various researchers have depicted it in different ways. The following are a portion of the meanings of a project.

- A project is named as a human undertaking that may misguidedly be viewed by its Stakeholders as a task when it incorporates a special extent of work that is obliged by cost and time (Cook Davies, 2016)
- A project is also depicted as a worth creation undertaking dependent on points of interest which is finished in each or concurred time and under imperatives including assets and outer conditions (O'Hara 2015).
- A project is characterized as the temporal endeavour undertaken to make an interesting item or administration that has a start and closure point. (PMI 2017).

2.3.2 Types of projects

As per researchers there are two generally utilized methodologies for characterization of undertakings, the first being the objective and techniques lattice introduced by (Turner 2016). The second one is called is called NCTP novelty (N) complexity (C) Technology (T) and Pace (P) Cochrane 2016).

According to Cochrane (2016), the metric of a project is how well the goals that are well defined. With the type 2 projects they are the ones that are not so we will be defined, and their processes and results are a bit unclear. With the type 3 projects, they are the kinds of projects that are defined very well but with unclear goals are well defined, but the goals are not that clear.

Examples of these projects are software projects or development projects.

And lastly with the type for projects in the core Matrix of those that has both goals that are defined and not so well defined. The explanation is portrayed in the figure 2 that is below.

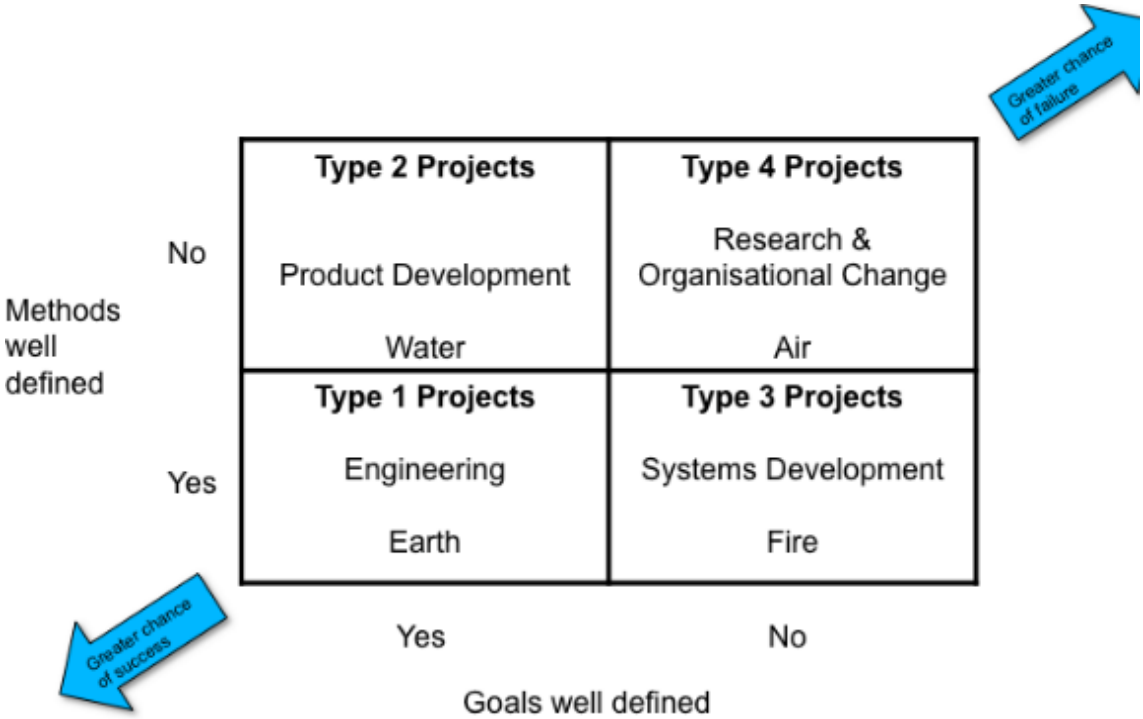

Figure 2: Types of projects Cochrane 2016)

In addition to this they are also three different type of project based on their complexity and size. There are three major characteristics of these projects.

- Hybrid projects
- Lean projects
- Extreme projects

quest2.3.2.1 Hybrid projects

According to Khazanchi (2016) have very high-level varying level of complexity in terms of their scope and risks with most of these projects including projects and underwater rail projects.

2.3.2.2 Lean projects

According to Zigurs (2017) lean projects have very low capacity and a very narrow scope in relation to the low risk, and such projects have got clear and the well-defined outcomes.

2.3.2.3 Extreme projects

Zigurs (2017) says that these are considered to have extremely high complexity and a broad scope with a very high risk such projects are usually in a critical spectrum. Because of this

there is a very need of very high communication skills even before the beginning of the project. Projects like this include NASA project.

2.3.3 Project life cycle

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According to Roseke **(**2016), the figure 3 below initiating stage where the project is defined, and a project manager is chosen. During the planning stage, a project scope and objectives are defined. During project execution stage, the actual work begins, where the project manager mage teams and ensure that the project remains within the budget and timeframe.

Bernie Roseke **(**2016) also says that during monitoring and control, the project is reviewed, tracked, and regulated. Lastly, the project is closed during the closing stage where there is a formal closure (Bernie Roseke 2016).

Figure 3: Guide to the Project Life Cycle by Bernie Roseke, (2016)

According to Brent (2014) a project can be developed and classified in three stages namely initial stage intermediate stage in final stage. However, these can be further developed into 6 lifecycle which is a pre – feasibility, feasibility, development, execution, testing and launch, feasibility, development execution and testing, launch and post implementation as depicted in figure 4 (Brent 2016).

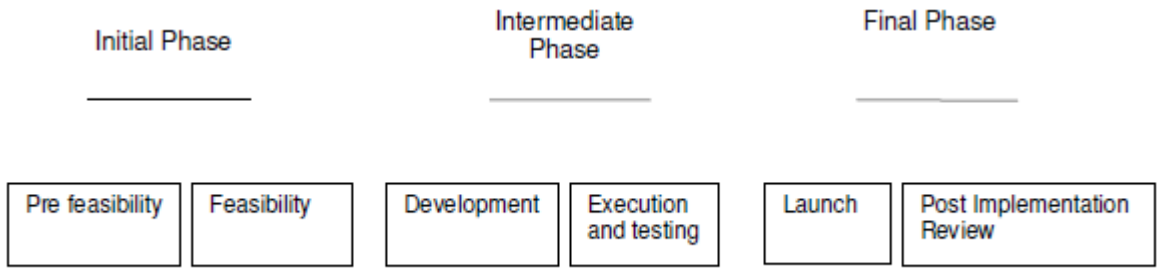

Figure 4: Project life cycle stages (Brent 2014)

2.3.4 Project management

Different authors have defined project management in different ways according to the literature search. PMI (2014) depicts project as the use of information abilities devices and strategies to extend exercises to meet task prerequisites, These undertaking the executive's instruments are practiced through the application and combination of project procedures of initiation. Execution, observing, controlling, and closing (PMI 2014).

Project Management concurring Oisen (2017), can be portrayed as an assortment of various devices various procedures to direct to utilize or coordinate asset towards achievement with a special complex assignment with time cost and quality is a compel.
APM (2015) says a project is communicating, arranging. observing and controlling all parts of your project and the inclusion of all stakeholders to accomplish project needs within an incredible time cost and execution standards.

2.3.4.1 Current project management practices.

According to Abbasi (2017), there are many methods and techniques that are used in project management, covering all aspects of from there to the end, and f these are widely used in many journals and other bodies of project management. Many of these practices are used in construction and project management many of these practices are employed in construction and project management for projects in developed as well as less developed countries.

PMBOK outlines many methods and techniques that are used in project management. According to the PMBOK (2017), initially there are seven knowledge areas in the current practices. It further defines these processes into ten knowledge areas is portrayed by the figure 5 below.

Figure 5: Project management knowledge areas (Srivansan, 2013)

2.4 Existing information systems and modelling systems used in the management of building and construction industry projects.

2.4.1 Information systems versus information modelling systems

Mantel (2014) says an information system is a combination of software infrastructure as well as hardware needed in an organization to facilitate control, planning, storing, coordination and decision making with its main purpose being to turn raw information into more useful information for the purpose of decision making in an organization. Mantel (2014) further says that business and construction firms use information systems also to manage their operations, interrelate with their suppliers and clients, a good example is the use of electronic markets like eBay. On the other hand, an information modelling system is a representation relationships, concepts, rules, and operations to specify data semantics for a domain of choice (Raymond 2014).

According to Turner (2019), PMIS are instruments and procedures used in embraced control to convey project information, and utilize these strategies and apparatuses to accumulate, consolidate and disperse records through electronic methods. Project data framework is used by upper and lower management to control to converse to together during project management (Turner 2012).

Raymond (2014), according to figure 7, Project management information system assist plan, executes well as their project management goals. At some point of their planning system, project managers use PMIS to come up with a budget structure including project estimation costs (Raymond 2014). Project management information system is also used to control data system and to create a selected timetable and define the project scope (Raymond 2014).

Figure 6 also illustrates how at the project execution stage; project managers and their team members collect records into one central database. In the centre of the figure 7, diagrammatically portrays how project management information system and its tools are tools and techniques are utilised in projects, to control and deliver projects. Project managers employ these techniques to gather, conglomerate as well as keep records in to enable the flow of project life cycle phases (Turner 2012).

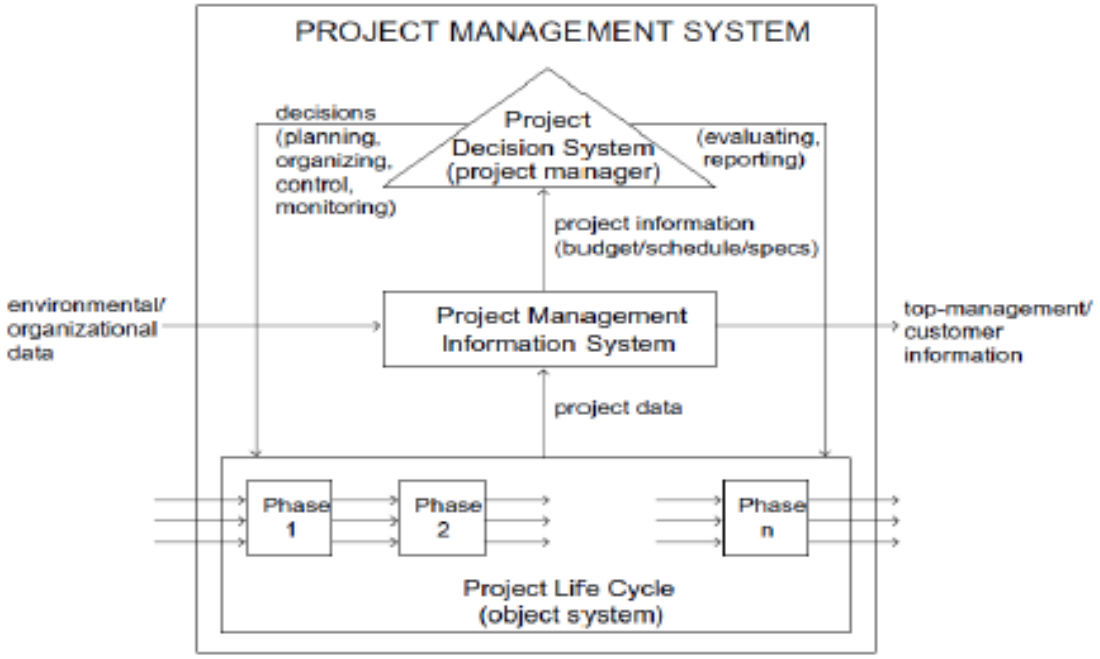

Figure 6: Project management Information System (Raymond2007)

As said by Mantel (2014), PMIS is employed to observe the starting position and compare it with real results for each daily doing, resources, acquire daily monetary statistics, for reporting purposes. During the duration of closure period, it is used to look back and to review the planned work and to compare with the actual tasks that were carried out (Mantel 2014).

Raymond (2014), states that PMIS are normally received by companies as software programs that are intended to offer project managers with tools and strategies and assist in the planning, organisation and offer full control of the project.

The advantages we get from using PMIS are not confined to the whole project performance, but additionally encompass project delivery, however, project management information systems have also been associated with direct effects on project goal achievement, financial control, and the fulfilment of project technical requirements (Raymond 2014)

Raymond (2014) states that there are five components that are put together if you want to produce a computer-based project information modelling system.

1. Hardware. This is the actual machinery in the computer and it often referred to as the

central processing unit CPU the other equipment include the input and output devices also the communication and storage devices.

2. Software. This is the heart of the computer. It stores computer programs and manuals that support the computer. The computer programs instructions that are inserted into the through this system function which produces useful data.
3. Data. Data is the information that is used by programs deduce information that is useful. Some people store the data in computer desks until the computer needs them.
4. Procedures. These are policies in the computer of the computer system.
5. People. These mainly do the importing of data, creating of data files, and storing them.

Project management information system is considered not to be important by some project managers. This is despite a project management information system that can provide project managers with all the data on their costs, performance, quality and time (Mantel 2014).

According to Sifri (2012), studies associated with describing performance of project management software, how to use it and the evaluation of the specific applications to support project management tasks include communicating, reporting, risk management, scheduling, estimating controls and managing of documents.

A significant drawback and limitations in the employment of project management information systems according to researchers might be the failure by project managers of understanding of the project management information system and associated tools, which has led to the underperforming of projects by project managers (Pinkerton 2003).

2.4.2 Information modelling systems in the construction sector.

A few information modellings (IM) systems have been identified as part of the literature review, and these include:

- Computer aided design (CAD)
- Building energy management system (BEM)
- Building performance management system (BPMS)
- Building Environment management system (BEMS)
- Building information modelling (BIM)

2.4.1.1 Computer aided design (CAD)

Computer Aided Design (CAD) can be followed back in time and associated with Euclid of Alexandria, a Greek mathematician, frequently alluded to as the "Father of Geometry". His works have been powerful in the fields of point of view, conic segments, round geometry, and number hypothesis in his popular composition. Jin (2016) elucidated a considerable lot of the proposes and sayings that are the establishments of the Euclidian geometry try whereupon the present CAD programming frameworks are constructed. After more than 2,000 years Ivan Sutherland, in 1963 as a component of his proposition at MIT, created "Sketchpad". This development empowered the planner to connect with the PC graphically by utilizing a light pen to draw on the PC's screen (Jin 2016).

Figure 7 shows how CAD was used in 2D to make floor plans from simple houses to major office complexes before the introduction of BIM. (Jin 2016). CAD is however almost becoming absolute especially after the introduction of BIM. Nowadays, BIM is now used to 3D make floor plans from simple houses to major office complexes, domestic dwellings, and industrial sites (Jin 2016).

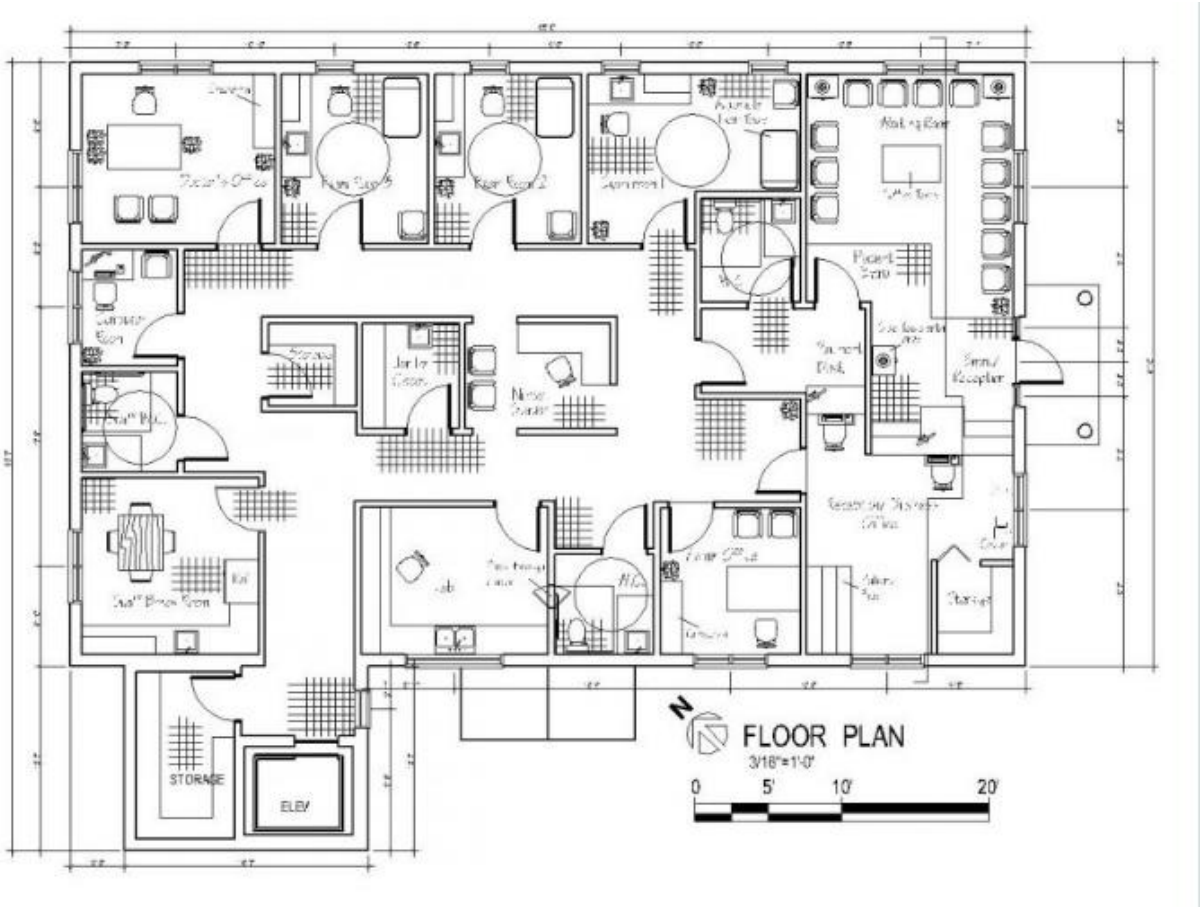

Figure 7: Gallery of Kerala House Plans AutoCAD Drawings Home Design (Jin 2016).

Information modelling (IM) systems like BIM, in the building and construction areas are regarded by several authorities, for example Ghaffarianhoseini et al. (2017) as a form of technological innovation, which should not be overlooked in the present day and age.

In the view of (Rogers et al. 2015a), there is an existing misconception that only large firms possess the requisite levels of skills and resources needed for the successful adoption and implementation of IM systems and related technologies. Yet, projects delivered by small companies in the building and construction sector in Australia might take advantage of Information Modelling systems significantly more than enormous estimated ventures as kept up by (Arayici et al 2011). Govan and Berisha (2017) envisaged that the adoption and implementation of modern day technologies could actually be easier for smaller to medium firms undertaking short duration projects. Rogers et al. (2015a) has suggested that small firms within the building and construction sector in Australia are slow to innovate and are faced with a myriad of barriers to innovativeness. According to Rogers et al. (2015a) these barriers include

a shortage of the requisite knowledge and resources as well as skilled personnel.

An investigation led by Aranda-Mena et al. (2019) in both Hong Kong and Australia suggested that different barriers existed for small and large firms as for the reception and execution of new technologies. Crucial findings by Palos (2017) reveals that contractors in the building and construction sectors lag behind architects and designers in adopting and implementing IMs. Also, it was established that key drivers towards IM adoption and implementation were centered on the IM's ability to reduce the magnitude of both errors and clashes as well as reducing excessive reworks on projects.

Research suggests that drivers behind the adoption of new technologies include improvement of visualisations are constructability and which in turn leads to enhanced productivity and conflict detection (Newton & Chileshe 2017).

In essence, the foregoing literature review has revealed that most prior studies on IMs in Australia and elsewhere have mostly covered large firms, of which only less than 10% of firms in the building and construction sector are large (Newton & Chileshe 2017).

There are several information modeling systems in use today, some of them include Asana, Accelo, Excel, Wrike and many more (Jin 2016). The following widely used information systems and information modelling systems will be explored to help provide a baseline for what additional information modelling systems may be achievable. It is however of paramount importance to note that so far BIM is one of the biggest players in the world of information systems, and is widely used across the project management fraternity, so it will be intensively discussed.

2.4.1.2 Building energy management system (BEMS)

In Australia, construction authorities are increasingly mandated to use building energy systems to meet the regulation which is based on performance such as the National House Energy Rating Scheme (NatHERS) (Robichaud 2017). To simulate and to predict the performance of your building, building energy modelling (BEM) systems have shown a lot of benefits when it comes to energy reduction and consumption (Robichaud 2017).

Lohnert (2016) says suggestions have been aired that the energy usage simulation on the early stages of building design stages enables easy making of decisions. Even though this is

advantageous, there are obstacles that make this process difficult as clients are mostly not ready to employ to engage many professionals in the early stages of managing the project (Lohnert 2016).

To create the building energy simulation more efficient, there to be a smooth transition from architectural building designs to a manageable energy model. With BEM, during implementation, there is normally a disjoint between the architects and engineers. To achieve a common goal into sustainable energy, professionals like need to work closer to each other to reduce energy consumption levels of new buildings in Australia (Lohnert 2016).

Building energy management systems have of late proven to be a major part of modern buildings worldwide but is still yet to reach its full potential. It has been noted however of late that the there is a slight increase especially with the use of new computer communication software (Lohnert 2016).

Figure 8 shows ways in which different microprocessor-controlled building systems interact with each other to form an intelligent BEM system of a modern building. These systems overlap and share a common bus system which eventually has interconnections.

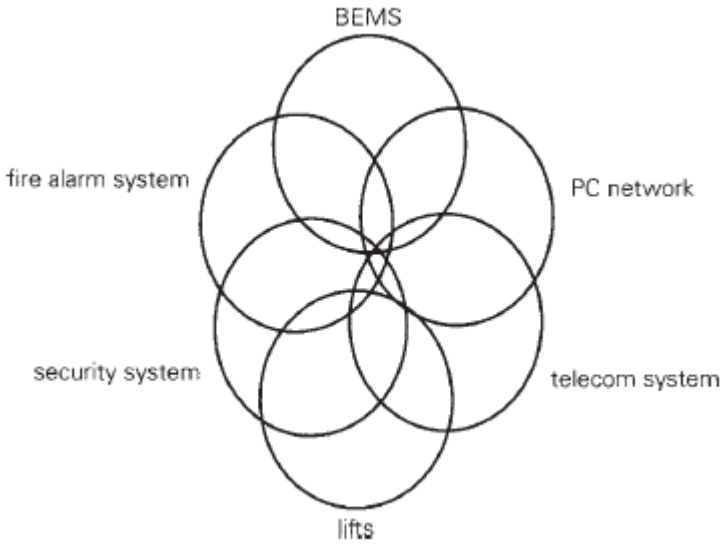

Figure 8: Microprocessor controlled building systems (Lohnert 2016)

2.4.1.3 Building performance management system (BPMS)

Wei (2018) says that when the building has been completed and when it is in its maintenance stage, it is very ideal to have an internal environment system to help the building to maintain

its good condition. In the past, some mathematical formulas were proposed to manage buildings and complexes (Wei 2018).

One of the major setbacks after completing a building is how to manage it cost effectively and very efficient for as long as possible and making sure that there is a minimal failure risk of the building (Hudson 2017). This is achieved using sensors and computer systems to monitor the building performance also some of the monitoring systems use Arduino microcontrollers then saving the information in the monitoring servers of the building or transported through message queuing telemetry transport protocol (Wei 2018).

The graph in figure 9 shows the change conditions in the performance of a building performance management system. To know the ultimate change in conditions in the performance of a building, one needs to know the conditions of change over a period of time, assuming that, the building takes an S –shaped curve when it comes to its deterioration (Hudson et al 2017).

The assumption also follows that the building itself follows progressive deterioration and not "acts of Godlike earthquakes and hurricanes. Another additional assumption is that the management action is swift when it comes to repairs and maintenance of the facility or building which will lead to a minimum acceptable performance level (Hudson 2017).

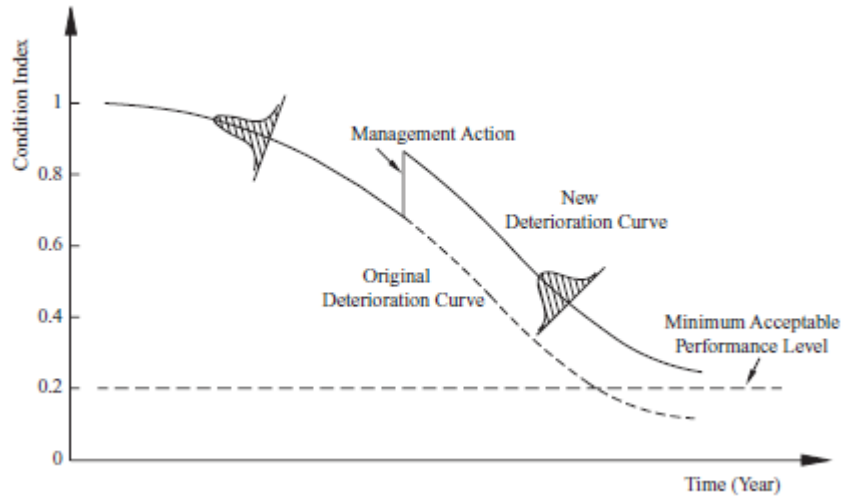

Figure 9: Change in conditions in the performance (Hudson et al 2017)

2.4.1.4 Building Environment management system

Many people have in general accepted the fact that the built environment indeed is vital towards the sustainability of the future, but it is sad to realize that the in the past years the main focus was on the construction of new buildings without paying much attention to the supporting infrastructure and environment around it (Jones et al 2019).

Jones et al (2019) says building environment management systems are generally designed to harness information about the built environment, in terms of gas emissions like carbon dioxide and relay the information to a central server of the building. European Union, (2020) said that if they we are to make the built environment more sustainable, then we will be able reduce carbon dioxide emissions, and so the difficult of improving the built environment must be addressed.

Jones et al (2019) says, if one is to manage the built environment in a sustainable way, and reduce emissions, one needs to fully understand the industry and the way buildings, transport and environment are all related in order to have an efficient environment management system. According to Jones (2019) and as depicted in figure 10, a model was developed to predict the environment in South Wales, UK, with the intent of trying to predict the reduction of the carbon dioxide and other emissions. In the model, users can access the user interface through "data highway" the GIS database and then to other subbranches of the model.

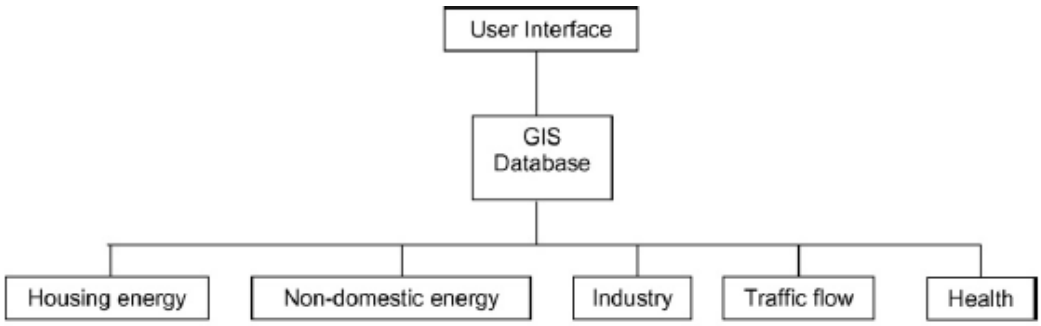

Figure 10: Environment prediction in South Wales, UK (Jones et al 2019)

2.4.1.5 Building Information Modelling (BIM)

Information modelling systems like BIM in the building and construction areas are regarded by several authorities, for example Ghaffarianhoseini et al. (2017) as a form of technological

innovation, which should not be overlooked in the present day and age.

In the view of Rogers et al. (2015), there is an existing misconception that only large firms possess the requisite levels of skills and resources needed for the successful adoption and implementation of IM systems and related technologies. Yet, projects delivered by small companies in the building and construction sector in Australia might take advantage of Information Modelling systems (IMs) even in large projects is maintained by (Hudson 2017).

Govan and Berisha (2017), envisaged that the adoption and implementation of modern day technologies could actually be easier for smaller to medium firms undertaking short duration projects. Rogers et al. (2015a) has suggested that small firms within the building and construction sector in Australia are slow to innovate and are faced with a myriad of barriers to innovativeness. According to Rogers et al. (2015a) these barriers include a shortage of the requisite knowledge and resources as well as skilled personnel.

In a study conducted by Mena et al (2019) in both Hong Kong and Australia suggested that different barriers existed for small and large firms. Crucial findings by Palos (2017) reveals that contractors who are in the building and construction sector left behind as well as architects and designers in adopting and implementing IMs. Also, it was established that key drivers towards IM adoption and implementation were centered on the IM's ability to reduce the magnitude of both errors and clashes as well as reducing excessive reworks on projects.

According to Park & Lee (2017), Building information modelling BIM can be defined as a way of managing and generating information on him in a building or in infrastructure during his development, Whilst the 3D visualisation are all the dimensional functions of BIM they not new especially to the great usage that this information in relation to the project and its delivery.

Several authorities have maintained that there are several opportunities and challenges associated with the adoption and implementation of BIM. Becerik-Gerber & Rice (2016), for instance, carried out a study wherein they investigated the extent of BIM and its usage in the construction sector. The study reveals that BIM has been utilised mainly for visualization, clash detection as well as the making of as built building models.

A thorough search of the literature further reveals that the implementation of BIM ushers in an opportunity for project management practitioners to control crucial variables which include

costs, time, and quality. This technology generally provides great opportunities for project managers in order to control important variables such as cost time and quality to some of the project stages especially designing Azhar (2017). In the view of Love et al. (2014), the control of the aforementioned variables creates room for the making of significant decisions, which create value for the project and the firm at large.

Authors such as Love et al. (2014) and Azhar (2017) concur on the view that there are great benefits that are associated when it comes to implementation BIM increase the production efficiency of the firm as well as general productivity levels. Whilst in agreement with (Azhar 2017); as well, Dainty et al. (2017) further assert that the benefits of BIM adoption and its implementation mainly result from the increased availability of information.

In the views of Wong & Fan (2018), BIM ensures that the design information is made explicit and is availed to all the relevant project stakeholders. Jrade & Jalaei (2018) also maintained that BIM; through improved management, efficient sharing, and utilization of information; supports decision-making in the project management sector. Data accessibility has become easier at the advent of BIM and through the application of BIM. Sacks et al. (2018) expresses the same views but in their own words and refers to BIM as a tool for gathering key competencies for joint decision-making and problem solving.

Figure 11 shows how BIM is now used to 3D make floor plans from simple houses to major office complexes, domestic dwellings, and industrial sites. As shown in figure 11, thru the predesign phase there is a lot of information and it is either written text or it is all spread in sheets which are in alphabetic order in the building data. All collected data generated in this phase is in a way then recorded into the BM software and most of the time is readily available for all the selected project stakeholders who will in turn come up with an agreed finished digitalized image.

Building information modelling (BIM) faces many challenges particularly in the maintenance phase which includes the project approach and the benefits which client organisation’s in Malaysia. (Kiprotich 2014). This in turn has resulted in acceptance across the industry resulting in an increase in BIM usage in Malaysia (Monozam et al. 2016).

Globally, construction companies have been adopting BIM, and there is some research and literature on BIM by Engineering and Project Management students who looked at implementation and process strategies and benefits, whilst also addressing a potential gap between BIM education and its findings (Monozam et al. 2016).

Through BIM Online and learning platforms, BIM has been identified by students as a positive way of learning and experiencing greater integration with the tools and approaches in the BIM education reviews and also highlights that there are advantages associated with Project Management in construction. Linderoth & Jacobsson (2018) recognises challenges associated with the implementation that include the Specific requirements of the system coma lack of knowledge readiness for the change (Linderoth & Jacobsson 2018).There is a bias in BIM literature towards looking at bigger organisations and overlooking smaller organisations or companies in Australia . (Monozam et al. 2016). This research tries to discover major barries which hinder the widespread and the adoption of BIM among the companies within Australia in the construction sector.
(Kiprotich 2014).

The most significant obstacles to BIM showed that intend out that most of them were associated with the less demand from clients and an option of and availability due too high set up costs of BIM for small projects (Linderoth & Jacobsson 2018). Those who make policies in other countries in states can also benefit from the findings so that they can overcome their own state or countries barriers and promote BIM adoption in their SMEs. (Monozam et al. 2016)

A study looking at determining the possible barriers faced by the implementation of BIM in the construction industry of Palestine which was conducted received 270 responses from construction industry professionals and findings that were obtained(Enshassi et al. 2016).

Park (2017) in their paper also focus on the importance in applying a practice that mainly integrates the building information modelling (BIM) the work breakdown structure (WBS) which have a more accurate outcome rather than the traditional technologies.

It is interesting to note that Lee (2017), in their writing, comment that the embedded technology within BIM systems shows that there is a tool that can be used to obtain picture of the building , however, a conversation in the reusable attributes of BIM

The BIM software in it's part of structural analysis of a project aims to define a way of communicating to produce a coherent into consistent document that it abides by the regulations it rules in a very consistent manner with strict time frames and making sure that the process is providing its effective technique which could be used utilized within other projects (Park 2017).
Gerbov et al. (2018)'s specific focus is placed on the analysis of residential dwellings to reduce find out on how BIM technologies can help in the implementation and assessment of crime factor ability for the new and proposed building designs.

Miettinen et al. (2018) states that Building Information Modelling (BIM) is a model of digital design is well is the management and it shows a great potential, Since it gives a representation of how possible in a way out of barriers that can happen in the documentation and preservation of the existing documents. The combining of BIM with the automation construction projects tends to improve the quality in control during analysis, and this makes it particularly relevant for the rapid intervention cases where they are hazardous conditions (Miettinen et al. 2018). Miettinen et al. (2018), says that from data collection regarding BIM, identifying as well is monitoring buildings that exist and the infrastructure in the critical review by selected criteria being nevertheless developed using general methods as well as tools for information management yes well as the exchange tasks in BIM.

Furthermore, (Miettinen et al. 2018), states that the center of the analysis looked at the technical in scientific relationships within BIM models, performance, diagnosis and features that identify specific activities together with methods and relevant tools for the enrichment of BIM.

In his closing remarks, Miettinen et al. (2018), explain possible gaps in the current knowledge in the literature that is outlined discussed within Subgroups on the performance and the assessment of the BIM software. With regards to BIM is it proposed framework in development and acquisition knowledge and collection of data for assessment in the performances of projects incorporation with its automation and at artificial intelligence which could be beneficial in the future projects (Miettinen et al. 2018).
Building information modeling BIM is widely recognized as promoter of productivity combined with innovation and BIM is slowly becoming a new standard in the construction sector is more significant in technology shifting now is buildings designed built, used and

managed using BIM (Wen & Rui 2018). It is one of the dominating technological software in this era that we are in and it is providing better and more comprehensive choices when it comes to buildings in terms of collaborating with building owners' developers, designers and so on. (Wen & Rui 2018).

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Monozam et al. (2016), stated that, with the growth of complex and large projects, claims are a subject more and more discussed in the construction sector. Building information modelling (BIM) is attracting more attention since professionals are wondering what the impacts of such a method could be on construction projects.

The other dimension of BIM which is related both to planning and cost has proven to be impacting both on the occurrence and on the support of claims, however, such impact can only be reached by following procedures of best practice. That is the reason why organisations should adopt BIM step by step and use it sufficiently to see the benefits from its many advantages (Monozam et al. 2016).

According to Abanda & Byers (2016), Building information modeling BIM today is increasingly being adopted especially in the early stages of construction projects where the construction is still being adjusted to give a final product. BIM is intended to give support to the whole project from the beginning to the end including the design stages the construction phase is not forgetting the facility management until disposal of the project.

BIM also grants a concept for database supported web, together with the web integration of software modules in the geometrical modeling of different levels in detail, giving an efficient numerical simulation tools which are based on the representation together with the process which manage the raw information that will have been acquired during the construction stages. (Monozam et al. 2016). In conclusion, BIM covers the full range of predesigning of information to the structural analysis giving a detailed design including integration and interactions with stakeholders with a special emphasis of giving to data management which provides the transformation of information into 3D visualization (Monozam et al. 2016).

2.4.5.1.1 The challenges of BIM adoption and its implementation

The positive results associated with BIM can only be realized if and only if the project practitioners comprehensively take into account all the possible pitfalls that are essentially inevitable at both project and organisation levels, Dainty et al. (2017).

A thorough search of the studies reveals that most BIM literature has so far focused on the mere technical aspects at the expense of inter-organisational issues, which include the social context of BIM adoption together with implementation and the changed business processes, (Peansupap & Walker 2015). Dainty et al. (2017) says that there are obstacles to BIM adoption and implementation are categorized as follows:

1. Obstacles related to the process.
2. Obstacles related to the social context.
3. Technical obstacles.
4. Obstacles related to BIM costs.

According to several authorities, for example Linderoth (2018), BIM is more than just the setting up of technological tools for the sake of improving the traditional processes which are old and ineffective..

A business process is defined by Lee et al. (2015) as a collection of two or more activities aiming to attain business objectives. The challenge, however, is that before adopting BIM, companies constituting the project management sector should be able to properly handle such ambiguities; changed processes. Furthermore, Linderoth (2018) reveals the difficulty of foreseeing the consequences of BIM implementation and the poor knowledge levels of the users of the BIM.

2.4.5.1.2 Social context obstacles.

As espoused by Linderoth (2018), the adoption and implementation of BIM impacts on both the technological environment and the social context. Thus, in the view of Chong et al. (2017), it becomes imperative to align the social nature embedded in construction projects with the functionality of technology. If the project management practitioners are ignoring the inherent social issues at the implementation stage, this may lead to failing of the BIM. (Linderoth 2018). Nevertheless, Govan & Berisha (2017) notes that there are very few practitioners who have a sound appreciation of the advanced BIM systems.It has been agreed amongst construction

professionals that the Building information modeling (BIM) will revolutionise the architectural, engineering and construction industry, impacts which will be felt you can buy stake holders such is owners facility managers . (Wen & Rui 2018). Figures currently show that stakeholders and owners perceive that BIM is a technology which is able to make a delivery of a project more efficient cause of the information integration, and owners are expected in the future to demand that BIM is used in order to prevent projects going over-budget and over-time. (Wen & Rui 2018).

The use and implementation varies across the globe, but looking into the usage BIM, Canada from the following a point of view, understanding the current implementation and challenges. (Enshassi et al. 2016)

2.4.5.1.3 Technical obstacles

According to Elyamany (2016), different companies in the construction sector make use of substantially different types of software; yet most of the BIM vendors do not guarantee interoperability between software. In the view of Jrade & Jalaei (2018), this compromises on the possible effectiveness of information sharing between project participants when BIM is implemented.

Wong & Fan (2018) advocated for adoption of BIM standards by project firms in the construction sector to resolve the problem of interoperability constraints when implementing BIM. The BIM standards would consolidate the many different initiatives that have so far been launched at national and regional levels to arrest this problem.

Kiprotich (2014) says, Green Star, an environmental programIs becoming mainly accepted is a mark of environmental sustainability in addition to design quality and is deemed one of the leading stream evaluation instruments for mostly sustainable activities. Mihindu & Arayici (2018).

According to Kiprotich (2014), however, whilst the goals of both the Green Star and BIM are said to be similar, there have been reports of a difference in the design strategy and process in New Zealand. Mihindu & Arayici (2018), say that to help with the practicality of the implementation of BIM procedures to assist with Green Star accreditation, the correlation

among the benefits and challenges of BIM have indicated that BIM supports most of the Green Star criteria.

Newton & Chileshe (2017) say that the key factor that affects the valuation process of BIM is in energy efficiency criterion, but questions around its implementation in challenges.

2.4.5.1.4 Associated costs with use of BIM

Becerik-Gerber & Rice (2010) in their research, revealed that total costs of BIM amount to, at most, two per cent of revenue. The BIM costs comprise the initial investment (consisting of the acquisition cost for BIM software, hardware, training of staff). As well, the BIM development process also entails financial costs. On the other hand, the architect may not include all the requisite information in the model and hence the contractor will have to incur costs on this aspect. According to Becerik-Gerber & Rice (2010) these costs which are incurred in the implementation of BIM are generally classified as overheads to the firm.

Empirical evidence shows that the implementation of BIM creates a positive financial impact as it saves costs by keeping minimal the costs associated with the retrieval of project information, as well as cutting down on the costs associated with a traditionally long project life cycle, Aranda-Mena et al. (2019). Aranda-Mena et al.(2019)'s view is consistent with that of Becerik-Gerber & Rice (2010) who earlier on propounded that the aforementioned cutting down of life cycle costs is the most important benefit derived from BIM adoption and its implementation, as life cycle costs are estimated to be much less than the initial project costs.

De Laat & Van Berlo (2011) went a step further and examined the impact of BIM and the implementation on Return on Investment (ROI). In his research, conducted on several contractors, he found that about 71 percent of contractors reported a positive change in the ROI change in ROI after BIM implementation. Lee et al. (2015) also argues and asserts that the application of BIM tools enhances accuracy during the process of cost estimation due to improved availability of information. The author contends that quantities for billing can be easily removed , and the author further alludes that this is of great value as the traditional approaches were often found to be insufficient (De Laat & Van Berlo 2011).

2.5 Research gap

Suppositions that can be drawn from the literature review above include that there has been a communication gap between project sponsors, project managers, design consultants, contractors, and other team members in construction projects leading to considerable inefficiencies. The earlier two-dimensional (2D) information systems have failed to prevent constructions projects, ending in lawsuits due to errors, unanticipated costs, omissions, increased financial expenses, arguments, and disagreements between project team members.

Wang (2017) agrees that there are benefits associated with IMs like BIM in terms of implementation, the production efficiency as well as general productivity levels. Whist in agreement with Wang (2017) as well as Ghaffarianhoseini, (2015) further assert that although there are benefits from IMs like BIM in the construction sector, however they may have failed to cater for all project life cycle phases which may be vital for greater project success.

Stewart (2017) alluded that indeed the building and construction firms to embrace new technology and development as there has been a general slow pace when it comes to building and construction, Additionally, he said that the slow uptake and effective use of these technologies, especially information and technology based has led to ineffective project delivery (Stewart 2017).

Rogers et al. (2015a), in the literature review, suggested that small firms within the building and construction sector in Australia are slow to innovate and are faced with a myriad of barriers to innovativeness. Rogers et al. (2015) these barriers include a shortage of the requisite knowledge and resources as well as skilled personnel.

It has been noted the advantages we get from using project management Information system are not confined to the whole project performance, but additionally encompass project delivery, however, project management information systems have also been associated with direct effects on project goal achievement, financial control, and the fulfilment of project technical requirements (Raymond 2014)

When it comes to building performance management system, several authors highlighted some information about the use of (BPMS) saying that none of the major setback after completing a building is how to manage it cost effectively and very efficient for as long as possible and making sure that there is a minimal failure risk of the building (Hudson 2007). This is achieved

using sensors and computer systems to monitor the building performance also some of the monitoring systems use Arduino microcontrollers then saving the information in the monitoring servers of the building or transported through message queuing telemetry transport protocol (Wei 2018).

The limitations of building environment management system were exhibited by Jones et al (2009) who said that building environment management systems are generally designed to harness information about the built environment, in terms of gas emissions like carbon dioxide and relay the information to a central server of the building. Wei (2018) said that if they we are to make the built environment more sustainable, then we will be able reduce carbon dioxide emissions, and so the difficult of improving the built environment must be addressed.

When it comes to building information modeling, literature display that there are several opportunities as well as problems associated with the adoption and implementation of BIM. Becerik-Gerber & Rice (2010), for instance, carried out a study wherein they investigated the extent of BIM usage in the construction sector. The study reveals that BIM has been utilised mainly for visualization, clash detection as well as the creation of as-built building models.

2.6 Possible obstacles to development of an IM system

The perceived positive outcomes associated with an IM system may only be realized if, and only if the project practitioners comprehensively consider all the possible pitfalls that are essentially inevitable at both project and organisation levels Dainty et al., (2017). A thorough search of the literature reveals that most IM system literature has so far focused on the mere technical aspects at the expense of inter-organisational issues. The current study broadens the scope of the literature review by focusing on possible obstacles in the implementation of an IM system.

According to several authorities, for example Linderoth (2018); Dainty et al. (2017), an IM system is more than just the setting up of technological tools for the sake of improving the traditional processes which are old and ineffective. By contrast, the several authors associate IM system with the mediation of innovation. In particular, Hoezen et al. (2016) asserts that IM system as a mediator for innovation examines and re-engineers each and every one of the

processes that would have been impacted; and thereafter creates completely new business processes and strategies.

A business process is defined by Eastman et al. (2019) as a collection of two or more activities aiming to attain business objectives. The challenge however is that before adopting IM system, companies constituting the project management fraternity should be able to properly handle such ambiguities; changed processes. Furthermore, Linderoth (2018) reveals the difficulty of foreseeing the consequences of an IM system implementation; owing to the poor knowledge levels of the users of the IM systems.

As espoused by Linderoth (2018), the adoption and implementation of IM system impacts on both the technological environment and the social context. However, Hoezen et al. (2016) notes that there are very few practitioners who have a sound appreciation of the advanced IM systems.

According to Palos (2017) different companies in the construction sector make use of substantially different types of software; yet most of the IM system vendors do not guarantee interoperability between software. In the view of Wu & Hsieh (2017), this compromises on the possible effectiveness of information sharing between project participants when an IM system is implemented. Wong & Fan (2018) advocated for adoption of an IM system standards like BIM by project firms in the construction sector to resolve the problem of interoperability constraints when implementing a project. The IM system standards would consolidate the many different initiatives that have so far been launched at national and regional levels to arrest this problem.

Becerik-Gerber & Rice (2018) in their research paper, revealed that the total costs of an IM system amount to at most two per cent of revenue. The IM system costs comprise the initial investment (consisting of the acquisition cost for an IM system, hardware, training of staff). Also, the IM development process also entails financial costs. On the other hand, the architect may not include all the requisite information in the model and hence the contractor will have to incur costs on this aspect. According to Becerik-Gerber & Rice (2018), these costs, which are incurred in the implementation of IM are generally classified as overheads to the firm.

2.7 Summary and conclusions drawn from the literature review.

The literature gathered identified that IM systems like BIM, in the building and construction areas are regarded by several experts, for example Ghaffarianhoseini et al. (2017) as a form of technological innovation, which should not be unheeded in the present day and age.
Numerous experts have maintained that there are several opportunities and challenges associated with BIM, Becerik-Gerber & Rice (2018), for instance, carried out a study wherein they investigated the extent of BIM usage in the construction sector.
According to Raymond (2017), project management information system only assist strategy, execute as well as their project management goals, as project managers. At some point of their planning system, project managers use PMIS to come up with a budget framework including project estimation costs (Raymond 2017). Project management information system is also used to control data system and to create a selected timetable and define the project scope (Raymond 2017).

According to the opinion of Rogers et al. (2015a), there is an prevailing misconception that only large firms possess the requisite levels of skills and resources needed for the positive adoption and implementation of IM systems in the Australian building and construction sector. It has also been noted that according to Wong & Fan (2018) advocated for adoption of an IM system like BIM standards by project firms in the construction sector to resolve the problem of interoperability constraints when implementing a project.
Lastly, the literature revealed that, there is a possible gap which might filled by the recommendation and adoption and implementation of a PMIMS. Scholars such as Wong & Fan (2018) present a more positive picture in as far as the gap in the Australian building and construction sector.

The present study is a response to the scrutiny of the current IM systems and the need for exploration of the issues relating to the potential expansion, adoption, and implementation of a PMIMS in the Australian Project Management construction sector.

The literature review examined the existing literature in the information systems employed in the project management in the construction sector in Australia. Literature gaps were identified to frame the research project more clearly, and to select appropriate methodology and research methods for analysing data for the following domains:

- Building and construction industry in Australia
- Project management of building and construction projects in Australia
- Existing information systems and modelling systems used in building and construction industry in Australia.
- Existing information systems and modelling systems used by project managers in the building and construction industry in Australia.

2.8 Factors to be considered in the exploration of issues relating to the potential adoption and implementation of an information modelling system.

In view of Migilinskas et al. (2018), the focal point for consideration of a possible IM system is the inter-relation between the objects (which have their own database) constituting the model and any other objects within the model. Several powerful and practical IMs tools which could be used for analysis, design and detailing have since been identified and developed by both academic and industry practitioners as a result of careful and critical analysis of the relevant literature. Migilinskas et al. (2018), says that within an IM system, specific details, for instance pricing data and the specific suppliers available could be included as digital data. Such information can be made available before, during and after the execution of the project. Over and above the facilitation of the information sharing process, a good IM system aids in maintaining more consistent and coordinated data around the various disciplines. (Kelly et al. 2018).

Wong & Fan (2018) states that the design information is made explicit through implementation and adoption of new IM systems and is availed to all the pertinent stakeholders. Aranda- Mena et al (2009) s view is consistent with the one for of Palos (2017) who earlier on propounded that the cutting down of life cycle costs is the most important benefit derived from IM systems adoption and implementation. Sabol (2018) went a step further and examined the impact of IM system implementation on Return on Investment (ROI).

Several authorities have touted information modelling systems as modern-day tools enhancing operational efficiency and effectiveness in diverse disciplines. A thorough search of the literature reveals the possible implementation of an IM system ushers in an opportunity for project management practitioners to control crucial variables which include financial costs,

quality, as well as time.

In the view of Love et al. (2014), the control of the variables creates room for the making of significant decisions, which create value for the project and the firm at large.

Fischer & Kunz (2014) maintained that IMs; through improved management, efficient sharing, and utilization of information; supports decision-making in the project management sector. Data accessibility is easier at the advent of IMs through the application of diverse IM software that enables efficient sharing and control of project information, Palos (2017). Tan et al. (2017) expresses the same views but in their own words and refers to IMs as a tool for gathering key competencies for joint decision-making and problem solving.

Empirical evidence shows that the implementation of IMs has a positive financial impact as it saves on costs by keeping minimal the costs associated with the project, as well as cutting down on the costs associated with a traditionally long project life cycle (Aranda -Mena et al 2009).

Azhar et al (2018) concur on the view that the possible benefits associated with a new IM system implementation increase the production efficiency of the firm as well as general productivity levels. Whilst in agreement with Love el al. (2014); Azhar et al. (2018) as well as Hoezen et al. (2016) further assert that the benefits of IM system adoption and implementation mainly result from the increased availability of information as well as the amplification of information management.

2.9 Analytical framework.

The literature review suggests that there has been a wide communication gap in the delivery of projects between project sponsors, project managers, design consultants, contractors, and other team members in construction projects leading to considerable inefficiencies. (Dainty et al. 2017)

The historical two-dimensional (2D) and three dimensional (3D) information systems have failed to prevent construction projects ending in lawsuits due to errors, unanticipated costs, omissions, increased financial expenses, arguments and disagreements between project team

members, as they only cover some parts and not all the stages of a project life cycle. (Dainty et al. 2017)

Researchers such as Wang & Song (2017), concur that the benefits associated with BIM implementation increase the production efficiency of the firm as well as general productivity levels. Whilst in agreement with Wang & Song (2017) as well as Ghaffarianhoseini et al. (2017) who further asserts that there are benefits from BIM adoption in the construction sector. However, BIM does not cater for all project life cycle phases which may be vital for greater project success. (Dainty et al. 2017)

To explore the research problem, a final analytical framework has been developed, showing the following major elements:

1. Current project management lifecycle stages and processes
2. Current IM systems used in building and construction projects by project managers.
3. Perceived PMIMS.

Current IM systems like BIM may not be broad enough to provide optimal solutions for construction projects in Australia. Most of them only start at the planning phase and end at the closure/ handover phase. It is however essential to note that essentially, the project lifecycle as depicted in figure 12, starts with the initiation stage and ends with the disposal of the project depending on the scope of the project.

The preliminary literature review below focuses on a historical overview of current IM systems and their application in project management of building and construction projects in Australia. These current IM systems may not currently cater for the whole project life cycle and may contribute to increased costs, duration, and reduction in expected quality, hence the research question: ***Can project managers better utilise IM systems to achieve more desirable project outcomes for building and construction projects in Australia****?*

The preliminary literature review focuses on a historical overview of IM systems and their application in project management of building and construction projects in Australia. This literature review includes a review of the most used IM system today, Building Information Modelling (BIM) which is widely employed during the design as well as construction phases

of building and construction projects overseas, and to a lesser extent in Australia. Such a review enables the researcher to appreciate the current application of IMs.

Several authorities have maintained that there are several opportunities and challenges associated with the adoption and implementation of current IM systems causing problems in project delivery. Becerik-Gerber & Rice (2018) carried out a study wherein they investigated the extent of the current IM systems usage in the project management sector and the current challenges and benefits associated with them.

The views of Aranda-Mena et al. (2017) are consistent with those of Enegbuma et al. (2016) who propounded that the reduction of life cycle costs is the most important benefit derived from the adoption of new IMs, and the savings in project life cycle costs brought about by its implementation would be more than the initial project costs.

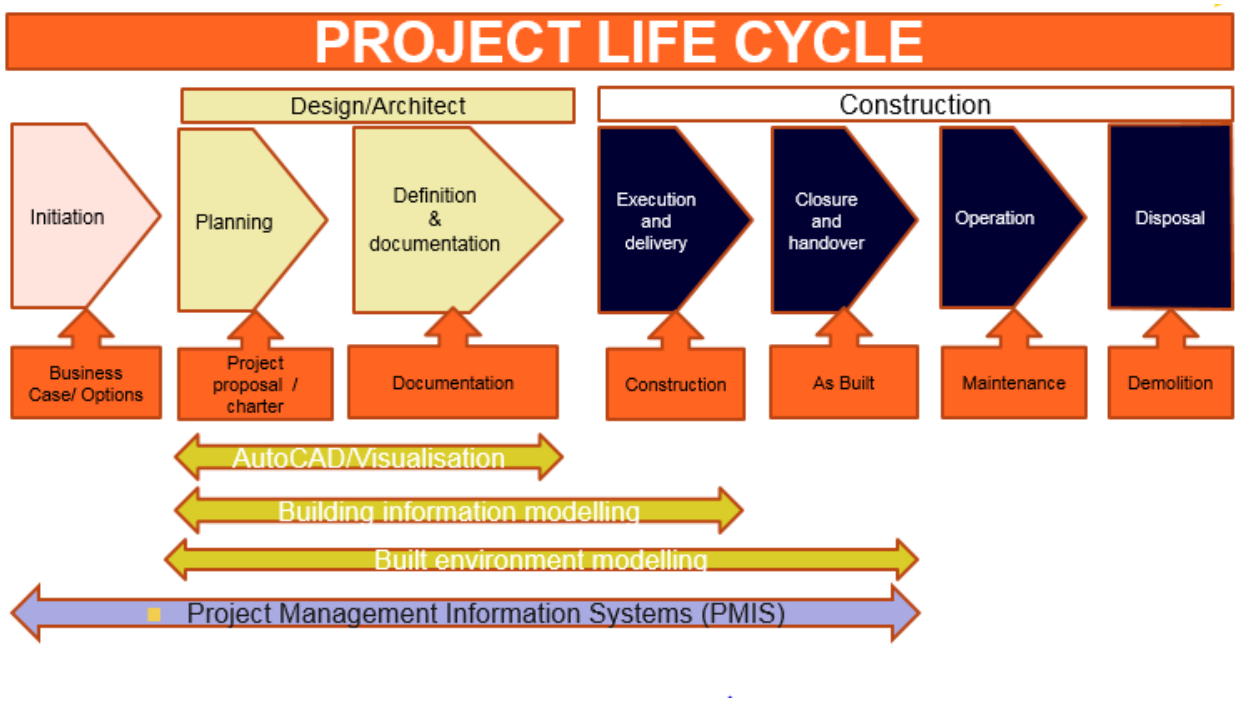

Figure 11:Project Life Cycle

Given the views of Wong & Fan (2018), current IMs ensure that the project information is made explicit for the project stages for which they are used, and is available to all relevant stakeholders. Chong et al. (2017), also maintained that the use of IMs may led to improved project management efficiency in sharing and utilization of information, and support decision-making in the project management sector across a limited number of stages of the project.

It has been indicated that the implementation of IMs across a broader range of project stages could allow project management practitioners to achieve greater control over crucial variables like such as costs, time, and quality at earlier stages of the project. (Azhar 2017).

Australia is a significant world economy, and it is argued that it should be among one of the innovator nations that adopt and implement new IMs that could help to bridge the current gap. Considering the foregoing, the current study seeks to determine if project managers can utilise new IM systems (highlighted in green in Figure 15) to provide optimal outcomes for construction projects in Australia.

This added dimension of PMIMS is shown in figure 15. This suggests that the current IM systems like BIM may not be broad enough to provide optimal solutions for stakeholders of building and construction projects in Australia.

Figure 12 also reveal that most of the IM systems only start at the planning phase and end at the closure/ handover phase, however, theirs was noted that from the perspective of the owner and user, the project lifecycle starts with the initiation stage and ends with the completion of the project.

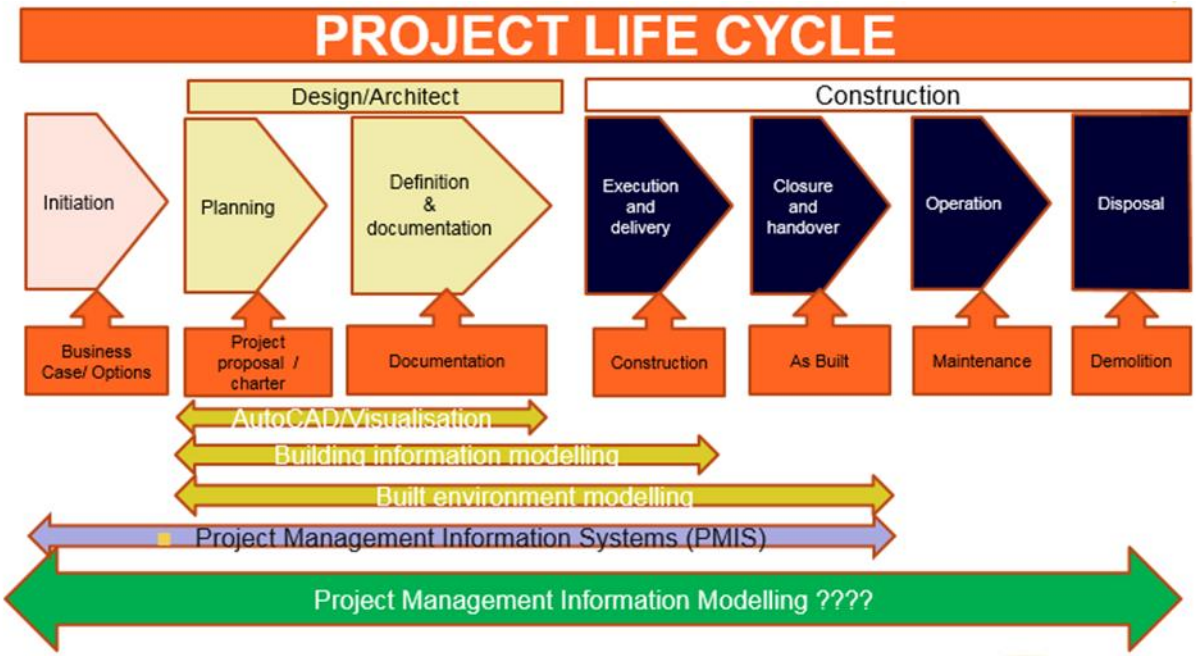

Figure 12 : Proposed Project Management Information Modelling

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter looks at the following aspects of the research project:

- Research philosophy
- Research methodology
- Research methods
- Data collection
- Data analysis
- Drawing valid conclusions from the data analysis
- Validity and reliability

This chapter endeavors to explain the research methods which were carried out for this study, and the argument that was made to select the most suitable methodology of this research. In the end, the chapter contains details of collecting data, analysing the data, making valid conclusions, and depicting its validity and reliability.

3.2 Research philosophy

Research philosophical worldview is often characterized by a research paradigm, summed up as the knowledge and development as well as the nature of the knowledge (Robson & McCartan 2016). Sekaran and Bougie (2016) defined an architype as a metaphysical position of defining realism, that has an agreement in a defined cluster of people and are mostly separated into two distinct groups, positivist, and social constructivist. It is argued however by Sekaran and Bougie (2016) that study is meant to develop a broad knowledge in a certain field and the main philosophies they suggested are positivism, interpretivism and pragmatism.

3.2.1. Positivism

Positivism was not seen as an appropriate philosophy from which to undertake this study because according to Sekaran & Bougie (2016), positivism is a "scientific method", which adopts natural sciences methods in knowledge generation, and entails 'operational with an element of observable social reality', producing an end product.

According to Sekaran & Bougie (2016), positivists' view of the world is that reality is objective and independent of the observer which makes it measurable and predictable and it is identified with quantitative studies (Sekaran & Bougie 2016). The positivist paradigm is prevalent in the social sciences as a means of understanding human behavior through observation and reasoning, with Wahyuni (2018) asserting that reality is objectively given and is discoverable through measurable factors independent of the researcher and the research instruments.

The positivistic paradigm depends on quantification in systematising the knowledge generating process which ensures accuracy of the results (Sekaran & Bougie (2016).
Consequently, this type of research is not influenced by the unpredictable behavior of human beings, thus the results are prevalent in the world of science and less common in arts-based research (Wahyuni (2018).

The positivist paradigm is however criticised, since individuals cannot be considered in isolation of the social environment they exist in making it impossible to understand them without taking into account and examining the views, meaning and motivations accredited to their own work (Winterton 2018).

3.2.2 Pragmatism

Pragmatism was also not seen as an appropriate philosophy from which to undertake the study because authors like Burgeronman (2008) maintains that pragmatism as a paradigm, emanates from situations, actions, and consequences apart from antecedent conditions. Bobbert (2017).

Pragmatism not limited to anyone's world view or a reality which is able to make it identifiable together with mixed methods, taking from qualitative and quantitative assumptions. (Harrison

2013). Researchers can select research methods, procedures and techniques best suited for their purposes and needs (Harrison (2013).

Proponents of the pragmatist view believe that research are always conducted in historical, social, political as well as other contexts. They believe in a world which is sovereign of the mind and that which is wedged in the mind (Sekaran and Bougie 2016). This implies adoption of mixed methods based on both positivism and interpretivism.

3.2.3 Interpretivism

Interpretivism was identified as the most relevant philosophy from which to choose an appropriate research methodology to undertake the study because interpretivism crops comprehensive data which gives a better insight of research (Robson & McCartan 2016). It also helps to elucidate people's actions, and goes beyond descriptions as it explores the reasons for a situation (Bartholomay 2018).

Interpretative researchers believe in many valid interpretations of reality which are time and context dependent (Cameron 2019). Social reality is often interpreted by the individual in accordance with other people, and through interaction with the wider social system, and reality is complex and multi-layered, with each phenomenon at a disposal of being affected by multiple factors (Wahyuni 2017).

In this research, the information gathered by the researcher from experienced project managers in the building and construction arena tallied with the view of Puig (2015), who said, "gained knowledge through personal research experience of each individual is much better, rather than something obtained from, or imposed from the outside". Therefore, the research unravels dimensions not yet explored related to various phenomena, instead of theoretical relationships between components, and the main emphasis is on human interpretation of events. (Puig 2015).

The use of qualitative approaches, scientific methods also help to explain people's actions, on the other hand interpretivism goes beyond descriptions as it explores the reasons for a situation. (Bartholomay 2018). However, interpretivists have been criticised for their approach which undermine representativeness and reliability. Results obtained are personal and in-depth which makes it impossible to generalize them. (Robson & McCartan 2016).

3.3 Research design

In the view of authorities such as Puig (2015), inquire about plan may be a common arrange of how the laid down investigate questions will be replied in a particular study. Winterton (2018b) maintains that it is a logical structure of the inquiry outlining how the research will be conducted, including the methods and strategies for data collection as well as analysis.

It follows therefore that a research design study and guides enable the researcher in determining data required, sampling methods, data collection and analysis procedures. Table 1 below provides the three main designs.

Table 1 Types of research design: Developed from (Neuman 2016)

	Descriptive	Explanatory or causal	Exploratory
Objective	Describe market characteristics	Determine cause and effect relationships.	Discover ideas and insights
Characteristics	Checked by the earlier definition of theories.	Manipulation of one or more independent variables.	Flexible Versatile Often the front conclusion of add up to inquire
Methods	Secondary information, Surveys Panels, Perceptions, and other data.	Try-outs	Expert overviews Pilot studies Secondary information Qualitative research
Research problem Status	Known	Clear definition.	Unknown or little is known.

Since the current study was primarily an exploratory one, it sought to obtain first-hand experience from project management professionals in the building and construction sector. Exploratory studies are not aimed at the entirety of the population; but are confined to the samples within the building and construction sector.

3.3.1 Descriptive research design

The design descriptive research design is mostly suitable where the researcher is seeking an insight into the features of certain variables in a phenomenon. In the present study, the

researcher sought a description of how PMIM would be incorporated in construction projects in Australia. Descriptive research laid a firm foundation in this study as it empowered the researcher to pick up an understanding of the environment relating to the use of a PMIMS in relation to project management practices in the Australian construction sector.

3.3.2 Explanatory or causal research

Explanatory or causal research often follows an exploratory or descriptive study (Robson & McCartan 2016). It builds on these studies to identify the cause of an event or the existence of a situation. Explanatory inquire about is profoundly organized and formalized with speculations and inquire about questions to be replied (Sekaran & Bougie 2016).
It is often investigative in nature, making it possible to identify patterns of interest to the research issue thereby laying the ground for future studies (Sekaran & Bougie 2016).

3.3.3 Exploratory research

In practice, exploratory research depends on qualitative strategies such as writing surveys, case studies, expert overviews, focus groups, participant observations and personal interviews, though it is not limited by techniques (Robson & McCartan 2016). As the role of PMIMS systems, and the attributes of an effective PMIMS system in the Australian construction sector are less understood, the whole component of this study would involve interviews and comparative document analysis.

Within the present study, the exploratory investigate plan was embraced as the researcher looked for to examine the boundaries to PMIMS adoption and execution within the construction segment in Australia.

3.3.4 Justification of the chosen approach

The intention of the study was to recognize the IM frameworks as of now utilized within the project management division within the context of building and construction projects in

Australia and to investigate and recognize issues related to the potential development, adoption, implementation of PMIM in the Australian building and construction sector.

The research utilised an exploratory approach. The methodology and design chosen enabled the researcher to be highly investigative and flexible as the data sought was highly qualitative in nature. The design permitted a throughout tracking down of facts and ideas in the examination of the wonder beneath investigation to find and clarify the possible contributions of PMIMS in the Australian building and construction sector; as well as the most suitable outlook of a PMIMS system.

Since not so much earlier research has been conducted to look at the execution of PMIMS within the construction sector in Australia, the researcher assumed an exploratory research design. The study designs permitted the researcher, to not only explore the opinions from the population under study, but also to deduce meaningful information on PMIMS adoption and implementation.

Another technique that could be employed was the descriptive comparative study, which made use of research from varied sources and geolocations in the quest to give an explanation as to why PMIMS had become such a topical issue in Australia and why there is need to urgently ensure the recommendation of a PMIMS system be considered for adoption so that the project management fraternity, particularly the construction sector, benefits with regards to improved efficiency and viability within the project life cycle. Owing to the span and try of this consider, a combination of qualitative and quantitative techniques, that involve numerical illustration and eloquent analysis, was made use of. In conclusion, the study is therefore investigative explanatory research.

3.4 Research methodology

Research methodology represents the combining of techniques and procedures into a specific situation for data collection, and the main aim is to be able to describe approaches used, and the types of paradigms of the research (Cohen 2017).

According to Creswell (2019), as depicted in table 2 below the research methods are separated into two fundamental sorts, subjective and quantitative. Qualitative is mostly about exploring,

asking specific questions, open minded questions mostly through interviews, yet quantitative is pre-determined instrument base questions, and is mainly concerned with numerical measurement and statistics data (Creswell 2019).

Table 2: Quantitative and qualitative methods (Creswell 2019)

Quantitative Methods	Qualitative Methods
• Pre determined • Instrument base questions • Performance data , attitude data, observational data and census data • Statistical analysis • Statistical interpretation	• Emerging Methods • Open-ended questions • Interview data, observation data, document data and audio-visual data • Text and image analysis • Themes, patterns interpretation

3.4.1 Qualitative research approach

A qualitative research approach comprises the collection of qualitative information, and utilize of fitting information analysis strategies grounded on theoretical frameworks and philosophical assumptions (Ruel 2017). Hurmerinta-Peltomäki & Nummela (2016) suggest that a qualitative research approach entails the collection and analysis of information in numerous forms. Henry Stewart (2013) also says qualitative research produces a non-quantitative and point by point account of small groups, with the aim of interpreting the meaning made by people concerning their being in a natural setting.

Consequently, qualitative approaches are suitable when describing small groups, organisation's and communities Hurley et al. (2017). Data collection techniques that are generally used include interviews and focus group discussions. (Kisely & Kendall 2017). A qualitative research approach is generally exploratory, thus observations made therefrom may be useful in building theory from the ground up. (Krivokapic-Skoko & O'Neill 2017). Theory is often inductive being either causal or non-causal.

It is imperative to note that qualitative inquire about, like several other sort of inquire about, has its qualities and shortcomings. Different creators highlighted the qualities of qualitative

investigate. A key quality of qualitative investigate is that it permits the speculation of discoveries to a bigger populace from which an agent test was drawn (Perren & Ram 2014).

Shankar et al. (2018), says the qualitative research method is moreover reliable since it employments an institutionalized meeting method which is connected similarly and reliably among all respondents, Hence, the same data is collected from all cases within the sample. (Sekaran & Bougie 2000). Additionally, qualitative research method is versatile because it can be used to investigate any anomalies or problem during research.

According to Campbell & Cowton (2015), when conducting a qualitative research, it is advantageous that the researcher administers the interview twice, in this way, it produces a result of the meet at a specific point in time, and any discrepancy of when the qualitative research was administered (Campbell & Cowton 2015).

Qualitative research methods are designed to obtain information on variables in same context, but at different time. Under normal circumstances, the researcher selects different people and conducts the research to ascertain differences in factors under consideration, thus the idea is to collect information on more than one case at a single point of time (Cameron & MolinaAzorin 2019).

Sekaran & Bougie (2019) posited that a qualitative research involves collection and analysis of qualitative data, till the results are obtained. Whilst the emphasis of the approach pertaining qualitative approaches of the research, they have equal or different ways of obtaining findings depending on the chosen approach and situation involved (Waysman & Savaya 1997).
The current study adopts a wholly qualitative approach. Adoption of the qualitative approach model was largely advised by Winterton (2018b), and with the qualitative approach being more dominant Ruel (2017) provides several benefits strengths and weaknesses of each approach to each research approach. Lastly, it is also possible to confirm and discover research findings as this qualitative data can be used to generate hypotheses in a research project (Ruel 2017).

3.4.2 Quantitative research approach

Mauceri (2016) described the quantitative research approach as involving measuring a phenomenon numerically, aided by statistical procedures, so that data can be processed to obtain results. Quantitative data encompasses closed information like behavior or attitude. This can be collected through closed checklists, against which an evaluation is made on the behavior observed by the researcher (McCarthy & Muthuri 2018).

There is need for standardised measures, to ensure that different perspectives and experiences of participants can fit into confined prearranged responses with pre-assigned numbers (Olokundun et al. 2018). Theory is often deductive being largely causal. Standardised research procedures are followed making replication more frequent and analysis of data commences from the application of statistical methods followed by discussions on the relationship between the results and the hypotheses (Park 2016).

3.4.3 Mixed research approach

Ruel (2017) says that mixed research entails combining quantitative and qualitative investigate approaches, strategies, procedures, concepts or other philosophical highlights into a single study to obtain better understanding of a research problem.

Wahyuni (2017) propagated that mixed research approaches are categorised in accordance with a level of information blending, time introduction and emphasis of approaches. The level of information blending is concerned with whether qualitative and quantitative information are completely or in part blended; time introduction concerns, whether the qualitative and quantitative stages of the investigate happen concurrently or consecutively of the other. Facilitation is when one approach assists the other, while complementarity is when two strategies are utilized in the investigation of different aspects of a problem. (Ruel 2017).

3.4.4 Justification of the selection of qualitative methodology

The current study adopts a wholly qualitative approach because it is the only way where experimental data collection is not practical (Shankar et al. 2018). The researcher also chooses

to use qualitative method because of the nature of research which had pre-determined questions and an interview to the selected participants.

Puig (2017) contends that of the several research approaches that exist, research students normally end up losing understanding on what approach to choose. Furthermore, he says that indecision in terms of choice is influenced by the complexity and scope of the research issue (Puig 2017).

According to Reinecke et al. (2016), a qualitative research can be connected to settled number individuals in different settings or settings, making data collection and investigation less overpowering, as the researcher goes into the field with prepared questions and fixed systems.

Additionally, qualitative research too show up to be quiet within the scope of complex themes since of predefined questions, to a such a point that it isn't conceivable to incorporate an expansive number of open- finished questions in qualitative research, and respondents are given the chance to precise themselves in their claim words (Puig 2017), to add on to that, during qualitative investigate, questions must be inquired employing a institutionalized method that's connected similarly and reliably over all respondents (Ruel 2017).

3.5 Research data collection

Data collection procedures should consider all data collection possibilities, moreover, methods applied should be organized, for instance, by the extent of prearranged nature, the utilize of open-ended and closed-ended questions, and emphasis on numerical (statistical) or no numerical data analysis (Sekaran & Bougie 2018). An instrument or test entails the use of a set of questions concerning attitudes such as a questionnaire or interviews while a behavioral checklist entails the use of observations of workers carrying out their normal duties.

For this research, data is collected by interviewing 8 project managers, selected with the help of the Australian Institute of Project Management. The interviewees were contacted for their willingness to be interviewed and to their best of time and knowledge. During the proposal stage, it was established how difficult it was to find project managers with the level of qualification and experience, especially in the project management information systems like

BIM so a figure 12 was chosen. We however only got a response from the 8 project managers whom we managed to get interviewed.

It is difficult to speculate what would have happed with a bigger number of participants, but I believe that the more the number the better, 4 interviews would not have been better that 8, and 8 is not better that 12, therefore a bigger number would have reinforced my findings. The research information sheets, containing the information about the research together with the consent forms were sent to the participants. All of them responded positively and interviews up to 30 minutes long were conducted and recorded using a mobile phone device which had speech to text function. The results were then analysed using Nvivo.

The actual steps taken are listed below to collect data.

1. Select participants from a group of project managers.
2. Send a research information sheet to participants.
3. Arrange time for interviews and conduct interviews.
4. Send consent forms and get them signed.
5.
6. Interview the participants and collect data.

This study utilized interviews to collect qualitative data from selected predetermined questions, and these were instrumental in the collection of qualitative data.

Burgeron (2017) continues to say that the logical order that occur during qualitative approach are:

I. Collect data in the field, be it field notes or transcripts.
II. Develop codes and analyse it to make sets of notes or pages of transcript.
III. The codes are converted into themes.
IV. Themes are arranged categorising similar phrases, relationships, and patterns.
V. Data is examined and develop meaningful patterns.
VI. Patterns are compared with previous research theories.

3.5.1 Data collection methods

Research data collection strategies frame the vital portion of the research, and major sorts of information collection strategies incorporate interviews, observations, surveys, and documentation (Sekaran & Bougie 2019. Each of these methods has distinct advantages and disadvantages as shown in Table 3, and further discussed after table 3.

Table 3: Research data collection methods (Sekaran & Bougie 2019)

Research Methods	Advantages	Disadvantages
Interviews	• The interviewee is on their own so they tell the truth. • You get to properly know/understand the participating audience.	• Interviewer can steer conversation to own advantage. • Time consuming to interview enough people. • Could make the interviewee feel uncomfortable.
Questionnaires	• Can be distributed on a wide scale. • Easy to evaluate data • Can contain both open and closed questions.	• It is tempting to skip questions or fake answers. • Distribution method may collect more of one type of audience than another
Surveys	• Gets views from a diverse audience. • High reliability.	• Not all of the audience sample may reply.

3.5.1.1 Interviews

. An interview could be a dialog between a researcher and a participant whereby the previous tests for answers from the last mentioned who is "…allowed to conversation transparently approximately a theme, to a great extent without the utilize of particular questions" (Robson & McCartan 2016). Interviews can be organized, semi-structured or unstructured. The researcher retains a level of control over the format of questions and answers in a structured interview which comprises of questions asked face to face in an ordered style with predefined response options (Reinecke et al. 2016).

This study encompasses the use of interviews, unlike questionnaires, observations and survey, interviews strengthen a study by getting first-hand information, as this involves using qualitative approaches. (Sekaran & Bougie 2000). Interviews make it easy in collecting data offers the guarantee of getting a "complete picture", in a way that any other strategy cannot accomplish. (Reinecke et al. 2016). Additionally, they bring together the qualities of both

information sets in arrange to compare, validate, affirm and authenticate qualitative discoveries (Reinecke et al. 2016).

According to Ruel (2017) interviews can be different depending on these different conditions which incorporate time, space and person. This implies that information can change based on the time at which information is collected, individuals included within the information collection prepare, and the setting from which the information is collected. Reinecke et al. (2016) indicates that, "on the off chance that the information from differentiating sources affirms the initial conclusion, at that point that conclusion can sensibly be held with more certainty than before". In this way, interviews can permit analysts to be more sure of their comes about, in this way too fortifying the creation of creative strategies, other ways of capturing an issue to adjust with customary information collection strategies, and it may moreover offer assistance to reveal the degenerate or off-quadrant measurements of a marvel. (Reinecke et al. 2016).

This helps to attain standardisation as the participants receive identical questions together with pre-coded response options useful in the generation of quantitative data (Winterton 2018b). With semi-structured and unstructured interviews, participants can speak freely about their views thereby enhancing discussion (Winterton 2018b). Participants can develop their ideas pertaining to the topic without being confined to predefined response options (Winterton 2018b).

Questions can be open-ended, where an individual decides the appropriate response or close-ended, where responses are predefined, confining them to attributes that a researcher seeks to investigate. Open ended questions collect qualitative information whereas close-ended questions collect quantitative information (Krivokapic-Skoko & O'Neill 2017).

3.5.1.2 Questionnaires

The use of a questionnaire was considered for this research project but was decided against because of issues relating to time and cost. A questionnaire is a set of pre-determined questions from which responses are sought from the research participants (Ruel 2017). It is suitable for collecting data from a large population within a certain timeframe which was not appropriate for this research project (Ruel 2017).

3.5.1.3 Observations

Observations were considered for this project but decided against as they were not appropriate nor efficient methods of collecting data and had time and cost issues for time-constrained research project.

3.5.1.4 Survey research

A survey was considered for information collection for this research study but was decided against as being inappropriate and because of time, cost, and a limited pool of experts from whom to obtain relevant data. Richer data can be obtained from interviews with a smaller pool of experts as comments and statements can be explored in more detail at the time.

A key weakness of survey research is that it is impossible to probe insights relating to the causes or processes relevant to the phenomenon being studied (Santos 2019). The other weakness of surveys is that they are generally not suitable for studies requiring an understanding of the historical context of the phenomenon. (Wahyuni 2017).

3.5.1.5 Focus groups

Morgan, D. & Krueger R. (2018) says that a focus group is a qualitative research whereby a bunch of individuals asked about what they think about is certain product, their opinions, their attitudes towards a service or their belief that your advertisement. The term focus group was first used the psychologist NS Henry (2018) and arose from discussions with social workers student's health workers where Henry and his friend in different backgrounds and different ideas. Although focus groups have a lot of advantages some people think that it is disadvantageous especially when it comes to mixed groups in which some people are young and others older, some have of different backgrounds and some are less educated than others. One of the disadvantages is that the researcher has less control over than one on one interviews as time can be lost through irrelevant discussions (Morgan, D. & Krueger R. 2018).

3.6 Data sampling

Sekaran & Bouige (2019) says that research investigations are almost impossible especially when one wants to gather data from the whole population, because of that, samples are used. Probability and non-probability are the two main types of data sampling.

3.6.1 Sampling frame

A sampling frame could be a comprehensive list of the individuals of the populace of intrigued (DeVore et al. 2017). It is a vital component of the generally test plan and gives implies of recognizing and finding the populace components (Zelnick et al. 2018). It is vital for an examiner to characterize the populace, counting depicting the components in terms of substance, units, degree, and time. In this regard, a examining outline ought to be able to supply a redress portrayal of the target population (Waysman & Savaya 2017).
A sampling frame is total if it has enough secured all individuals of the population, and precise on the off chance that each part of the population is included as it were once (no duplication). It moreover must be current in arrange to be total and exact, since an ancient testing outline would be wrong and inadequate due to changes which happen over time (Zelnick et al. 2018).

Random number generators like found on the World Wide Web can be applied to get numbers to be used in recognizing people to be included within the sample (Rahmani & Atia 2017). Sampling frame is comprised a list of names of all objects locked in, each title is relegated a unique number, and with the assistance of irregular number generators, a set of numbers related with company's names is arbitrarily chosen. Utilizing haphazardly generated numbers, the names related with the numbers within the examining frame are distinguished (Olokundun et al. 2018).

3.6.2 Sampling technique

In social science research, likelihood (moreover called random) and non-probability testing techniques are generally applicable. These two techniques are discussed in detail below.

3.6.2.1 Probability sampling

This study employs the use of probability sampling. Using the probability sampling technique, an equal opportunity exists for all the members in
a population to be chosen and be agent of the complete population (Hurley et al. 2017). With probability inspecting, all components within the population have a few opportunities of being

included within the sample test, it therefore follows that mathematically, probabilities that any of the elements will be chosen can be computed (Hurley et al. 2017).

According to Delen & Zolbanin (2018), say random samples are more likely to have errors. Thus, random samples are naturally a more representation of the study population and the research findings obtained are more generalised as they highly reflect the features of the study population. Random sampling also enjoys being bias-free as each constituent part of the population stands the same chance to be chosen for participation in the study (Fawcett & Giangrande 2017).

3.6.2.2 Non-probability sampling

Using this approach or technique, the probability of each member of the population being selected is not easily specified (Winterton 2018a). In the view of 2017), the choice of a non-probability sampling strategy makes it awkward for the researcher to statistically project the estimates obtainable in the research findings to the entire study population.

Hurmerinta-Peltomäki & Nummela (2016) weighs in on non-probability sampling and asserts that this technique still enables generalisation about the study population; except that the generalisation cannot be done on statistical grounds. Characteristic of non-probability inspecting is the utilize of the researcher's individual judgment in deciding which elements of the study population to include in the study sample (DeVore et al. 2017).

3.7 Data analysis

Once the data were collected, the researcher ensured that the interviews are completed conducted correctly and that the data contained therein is presented for further processing. As a result, editing is done to enable the researcher to check for errors and omissions from collected data.

Responses gathered from face-to-face interviews are analysed for the separate points that they made through the assignment of code numbers. Burgeron (2017) says that there are three main

approaches when it comes to qualitative data analysis namely, interpretative, social anthropological and collaborative approaches. Interpretative investigate approach was utilized for this ponder. Interpretative inquire about approaches a cruel for the disclosure of commonsense understanding of implications and its activities (Burgeron 2017).

3.7.1 Coding of data and analysis using Nvivo.

Data analysis was conducted following the steps below.

1. Develop codes and analyse it to make sets of notes or pages of transcript using Nvivo.
2. The codes are converted into themes, having had 852 files and 89 coding references as depicted in data coding table annexure 8.9.
3. Themes are arranged categorising similar phrases, relationships, and patterns from the 8 participants who altogether had different number of words for analysed.
4. Data is examined and develop meaningful patterns.
5. Patterns are compared with previous research theories.

3.8 Validity and reliability of data

Leung (2015), defines validity as the truthfulness and accuracy of the data and should be accompanied by the instrument of measure and description of what it is supposed to measure. Flower (2016) describes reliability as the consistence, the stability and the repeatability of the data provided and the capability of collecting and recording data correctly and accurately and reliably the same results after recurring testing periods using the same research method.

According to Flower (2016), reliability is the consistency in reaching the same result when the measurement is made repeatedly. It is the degree of consistency with which it measures a variable (Campbell & Cowton 2015). Validity, on the other hand, alludes to the degree to which the data collection methods are able to accurately measure what it was intended to measure (Sekaran & Bougie 2018).

For the most part, validity and reliability address issues concerning the quality of the information and fittingness of the strategies utilized in conducting investigate. The quality of the information and the suitability of the strategies utilized are especially vital in social

sciences, since of the diverse philosophical and methodological approaches to the think about of human movement (Chong et al. 2017).

Validity and reliability are of essential concern for information quality control measures in inquire about the precision of the information collection procedures (McAloney 2019). Hence, a study is considered to be substantial when the conclusions are genuine or correct (Ruel 2017). A mixed study, the quantitative aspect focuses more on limiting dangers to validity, since the objective of the study must be representative of what the analyst is investigating (Smith 2015). However, the qualitative aspect focuses on authentically capturing the live experiences of people (Winterton 2018a).

To improve the validity of data collected, the researcher engaged himself in doing a thorough review of the literature before in his endeavour to enhance data validity. The literature review exercise enabled the researcher to identify the concepts involved in the topic thus enabling the said researcher to collect data, which was relevant to the topic. Before the collected information was dissected, it was screened for mistakes and exclusions that would affect the outcomes of the analysis. It is of fundamental significance to note that in arrange to progress the validity of information collected, the researcher engaged himself in doing a focus group discussion to validate the findings of the initial interviews.

3.9 Ethical considerations

Jamali (2017), says it is important to do admit that corporations have Corporate Social Responsibilities (CSR) that they need to adhere to when researching and they have to consider them including financial duties, lawful duties, moral obligations and magnanimous duties.

Hargrave (2015) alluded saying whilst corporations have a sole mandate to make profits when they carry out some research, ethical issues have to be clearly dealt with beforehand as they tend to relax when it comes to business ethics and just act as a sense of duty. Additionally, Jamali (2017), suggests that Research Ethics Committees and Review Boards have been formed to look into research protocols because of previous patient harm through medical researches like European Research Ethics Committee, Human Investigate Ethics Committee (HREC) in Australia.

The current study entailed the gathering of data from humans, and as such the researcher will be cognizant of the ethical considerations. In this regard, the researcher had to observe the following ethical aspects.

In Australia, all human research projects conducted at the university by students or staff entail ethical approval before starting any research, furthermore, applications are made to the relevant Ethical department showing the supervisor's name, and the student identified as the researcher (McAloney 2019). After the submissions, the ethical committee review all research proposals involving the participation of humans to ensure that they can be accepted ethically. To carry out this research, the analyst had to experience an application handle for inquire about endorsement by the University of Southern Queensland, although the research office. The application ID: H18REA035 was approved prior to the starting of the research.

3.9.1 Confidentiality and anonymity

The researcher guaranteed the respondents anonymity and confidentiality by not requiring any contact details from respondents.

3.10 Voluntary participation

In the process of soliciting for respondents' participation in the research, the researcher had to stress the point that participants were free to choose whether to be part of the group for the current study. The fact that there would not be any financial remuneration for taking part in the research was also clearly stated to the respondents.

3.11 Informed consent

Respondents were fully informed of the nature of the research and the objectives thereof.

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3.12 Limitations of the study

The research findings of the show research are subjective in nature and hence require dependence upon a judgmental translation of the findings. Too, while the respondents were cooperative during the research, the researcher strongly feels that the number of respondents was generally adequate considering the population of firms in the building and construction sector within Australia.

The times that interviewees were available were after hours, so some had to be rescheduled causing time delay, but the researcher performed all the possible and necessary analysis until the researcher was satisfied with results. It however follows that the conclusions arrived at within the current study are a full representation of the entire population.

3.13 Chapter summary

The chapter discussed the research design, the targeted population, sampling techniques that were employed, how data was collected with techniques used to ensure data reliability, research instruments employed and how the data was processed and presented. The subsequent chapter will focus on data presentation and analyses.

The researcher made analysis and interpretation of primary information that was accumulated from the organized interviews managed to project managers of chosen organisation's within the building and construction sector in Australia. Information from the organized interviews was displayed in and analysed. This was compared using information obtained from the interviews which were carried out with key informants from eight selected large firms in the construction sector.

Even though this study used a qualitative research approach, the researcher found it worth discussing other research approaches like quantitative and mixed approach for the sake of future research and assisting the readers understand why qualitative method was found best for use in this research.

Additionally, the present research utilised an exploratory approach and design which enabled the researcher to be investigative and flexible as the data sought was qualitative in nature. The

design permitted a thorough tracking down of facts and ideas in the examination of the phenomenon under examination to discover and explain the possible contributions of a PMIMS in the Australian building and construction sector.

Finally, Chapter 3 described how data was collected and analysed. Subsequently, the current study was primarily an exploratory one, it pursued to obtain first-hand experience from project managers in the building and construction sector. This approach was expected to enable the researcher to identify issues to assist in the development and implementation of a perceived PMIMS system to be implemented by construction firms in Australia.

CHAPTER 4 RESULTS, AND INTERPRETATION

4.1 Introduction

This chapter presents the results of the interviews and their interpretation. Primary data for the study was accumulated from the organized interviews managed to the extend supervisors of chosen associations within the building and construction sector in Australia. Data from the structured interviews was presented in tabular form and analysed using Nvivo by means frequencies and percentages. This was compared using information obtained from the interviews which were carried out with key informants from ten selected large firms in the same sector.

4.2 Response rate analysis

This section outlines the response rate of the interviews as this has a bearing on the validity and reliability of the information. Table four presents the outcomes about on the response rate analysis.

Table 4: Primary interview data

	Target number	**Frequency**	**Percent**
Interviews	8	8	100

All the eight planned interviews were successful. The attained response rate was considered adequate to validate the research in line with what was suggested by Sekaran & Bougie(2000) that a thirty percent response rate validates a research.

4.3 Results obtained from Nvivo analyzing software.

When the interviews were carried out, the researcher had the research question at the back of his mind, "***Can project managers better utilise IM systems to achieve more desirable project outcomes for building and construction projects in Australia"***? Being cognisant of that,

the researcher had an interest in the words or synonyms of the words that make up the question. The words and phrases like, better/improve information modelling system, time, cost, and quality. Figures 16, 17 and 18 using Nvivo for analysing depict the ways which these particular words are intermarried in form a tree from each of the eight participants. Some participants might not have used the exact same words but synonyms that form part of the integral research question.

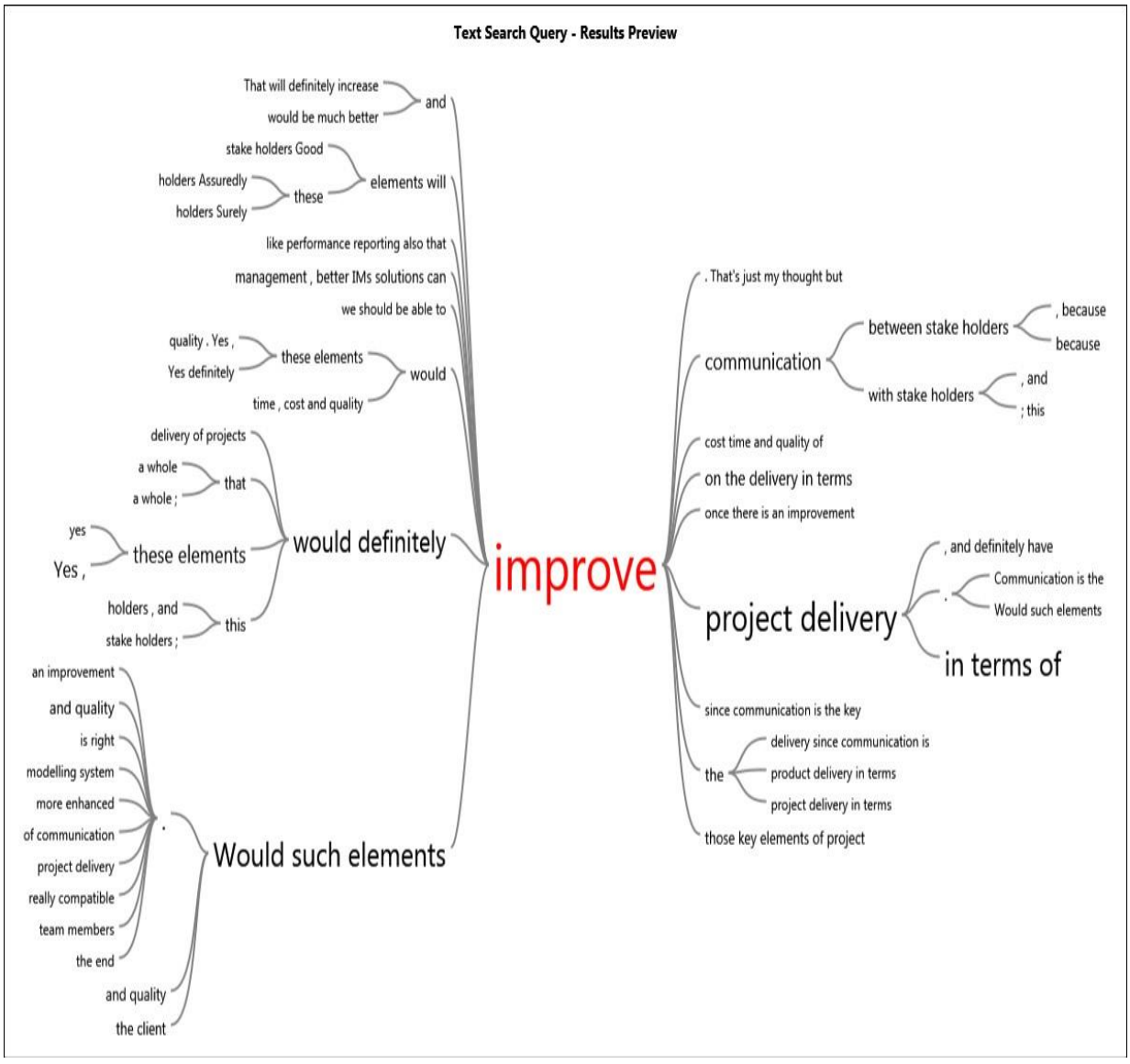

Figure 13: Results from analysing "improve" using Nvivo.

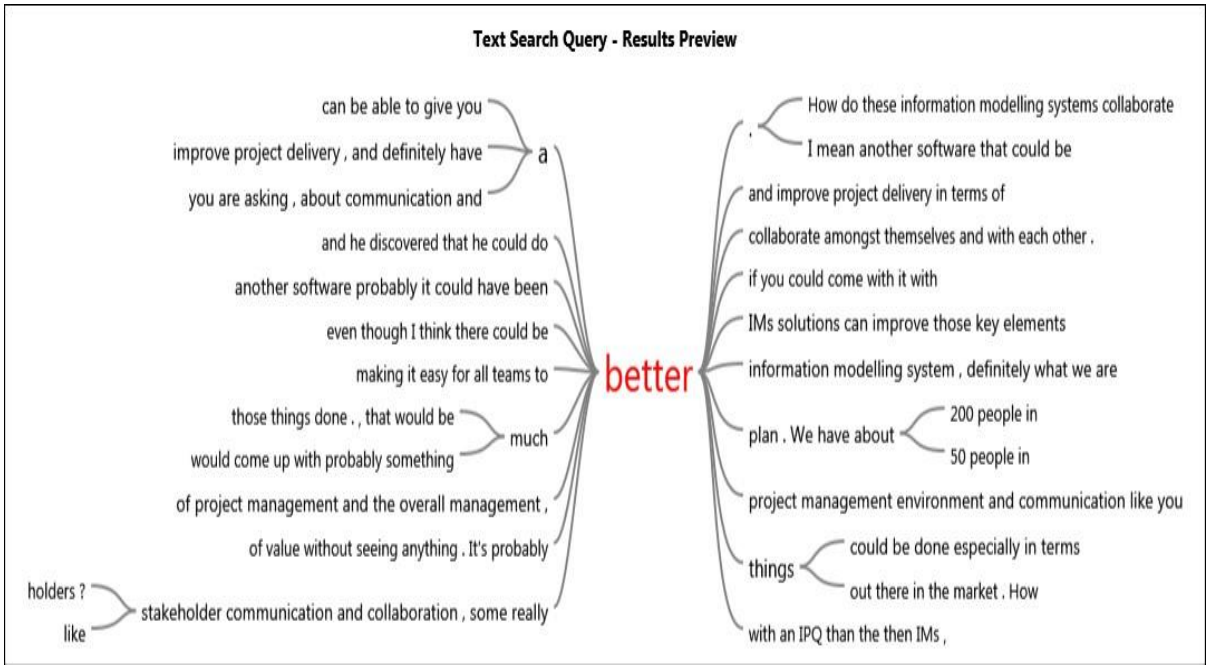

Figure 14: Results from analysing "better" using Nvivo.

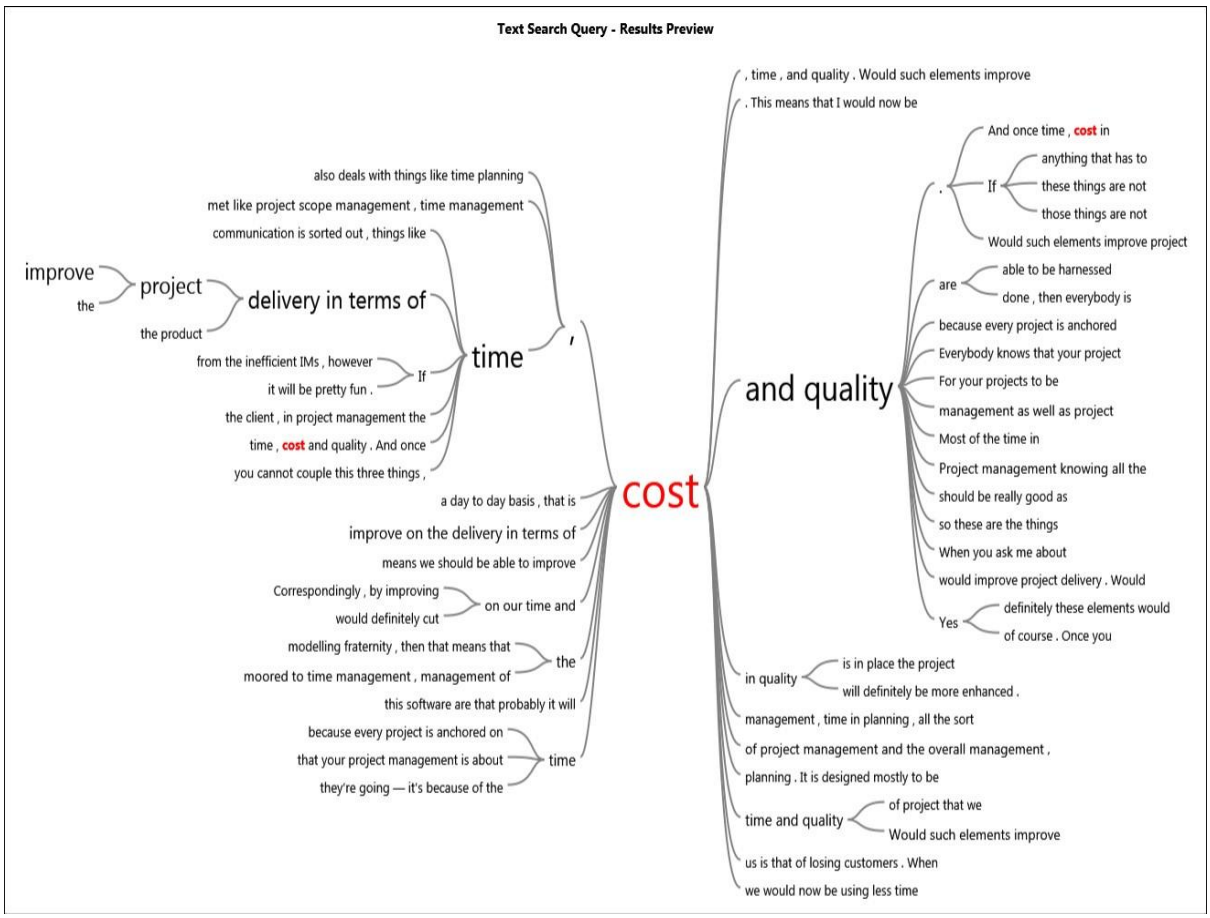

Figure 15: Results from analysing "cost" using Nvivo.

Nvivo research analysing software also enabled the researcher to find out what number of participants spoke how many words during interviews, the percentage frequency of the words, and which particular words were spoken most. Table 5 portrays the analysis using commonly spoken words and their percentage frequencies.

Table 5: Results from analysing common words using Nvivo.

Word	Number of participants	Count	Weighted Percentage (%)
project	8	251	5.38
information	8	165	3.54
management	8	138	2.96
modelling	8	131	2.81
system	8	88	1.89
like	8	87	1.86
systems	8	67	1.44
time	8	65	1.39
delivery	8	64	1.37
able	8	60	1.29
things	8	55	1.18
terms	8	53	1.14
projects	8	49	1.05
communication	8	48	1.03
software	8	45	0.96
improve	8	41	0.88
think	8	39	0.84
used	8	37	0.79
elements	8	36	0.77
holders	8	36	0.77
stake	8	36	0.77
cost	8	35	0.75
want	8	34	0.73
well	8	34	0.73
just	8	31	0.66
quality	7	30	0.64
useful	7	28	0.60
work	7	28	0.60
another	7	27	0.58
without	7	27	0.58
good	7	26	0.56
using	7	26	0.56
definitely	7	24	0.51
done	7	24	0.51
especially	7	23	0.49
need	7	22	0.47
sure	7	21	0.45
company	7	20	0.43
help	7	20	0.43
people	7	20	0.43
planning	7	20	0.43
since	7	20	0.43
also	6	19	0.41
difficult	6	19	0.41
Word	**Number of participants**	**Count**	**Weighted Percentage (%)**

really	6	19	0.41
something	6	19	0.41
better	6	18	0.39
probably	6	18	0.39
yeah	6	18	0.39
collaboration	6	17	0.36
look	6	16	0.34
making	6	16	0.34
building	6	15	0.32
collaborate	6	15	0.32
PMIMS	5	15	0.32
construction	5	14	0.30
everything	5	14	0.30
long	5	14	0.30
much	5	14	0.30
attributes	5	13	0.28

4.4 Respondent's demographic profiles

The respondents were drawn from different organizations to avoid getting repetitive information from an organisation. Therefore, it becomes important to consider their demographic information, to make sure that the results variable across the participants as this influences the validity and reliability of the results.

4.4.1 Profile for the Project Manager

This section seeks to gather demographic information relating directly to the respondent who is the project manager.

4.4.1.1Gender distribution of respondents

Respondents were required to indicate their sexual orientation. Figure nine underneath presents the findings on the gender of the respondents.

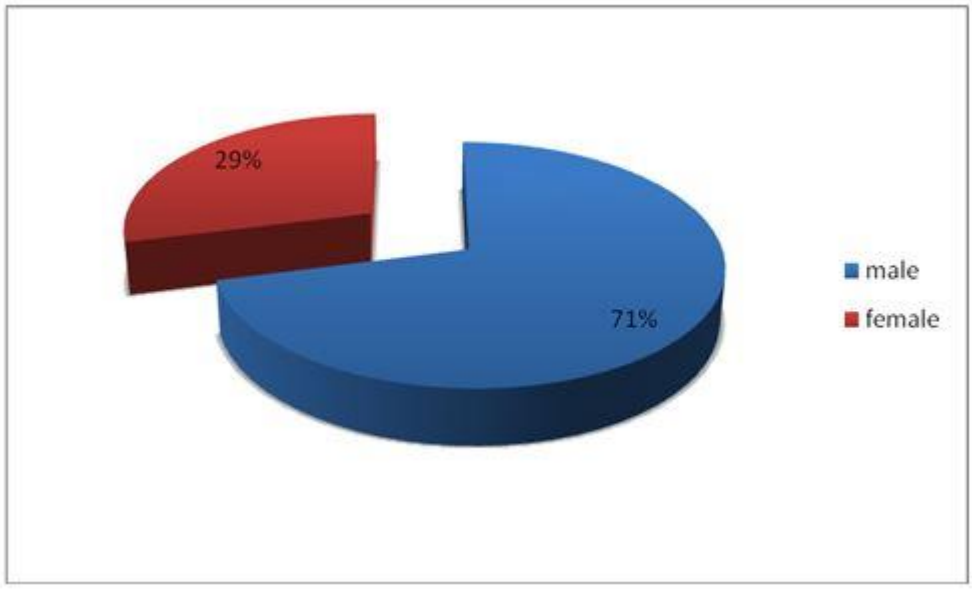

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Figure 16 : Gender distribution of respondents

Figure 16 above shows that a greater extent, almost two thirds of the respondents were male, and the remainder were female. According to Singer et al. (1998), it is natural that people of different gender may have dissimilar attitudes toward situations and events. It is evident that there was a gender imbalance with males dominating the sample. The imbalance was representative of the working population within the construction firms in Australia which is skewed towards the male population. It was concluded that the imbalance would not significantly affect the results as efforts were made to obtain a sample which was representative of the population. It was therefore possible to obtain views from both genders on the application of the project management information modelling system for building and construction projects.

4.4.1.2 Age of respondents

The respondents were asked to show their age range. Table seven is a presentation of the findings on age distribution of the respondents.

Table 6: Source: primary interview data

Age of respondent	Percent	Number
18 – 28	0	0
29 – 38	25	2
39 – 48	25	2
49 – 58	50	4
Above 59	0	0
Total	100	8

Most of the respondents were in the age range twenty-nine to thirty-eight years (twenty five percent). This was followed by thirty-nine forty-eight years (twenty five percent) and forty-nine to fifty-eight years (fifty percent). No respondents were in the age range eighteen to twenty-eight years and above fifty-nine years. All the age ranges were represented in the sample, so it was possible to obtain information across all ages on the application of the project management information modelling system for building and construction projects.

4.4.1.3 Duration in current position

This section focuses on the respondents' working experience in the current organisation as the issue of public procurement and government projects requires one to have been with an organisation for a considerable time. Table seven presents the findings on respondents' working experience.

Table 7 : Duration in current position

Working experience	Percent	Number
Less than 1 year	0	0
1 to 5 years	0	0
6 to 10 years	25	2
11 to 15 years	50	4
Above 15 years	25	2
Total	100	8

Most of the respondents had been working in their current position from between eleven to fifteen years (fifty percent). This was followed by respondents who had been working for the current organisation for between six to ten years (twenty five percent) and those with working

experience above fifteen years (twenty five percent). The respondents had gathered adequate experience so that they were likely to provide meaningful contributions to the study on ways for embracing a project management information modelling system for building and construction projects.

4.4.1.3 Highest level of education

Table nine presents the results on distribution of the respondents in line with their level of education.

Table 8:Highest level of education

Highest level of education	Percent	Number
Primary	0	0
Secondary	0	0
Diploma	0	0
Degree	25	2
Postgraduate degree	75	6
Total	100	8

Most of the respondents had attained a postgraduate degree (seventy five percent) as their highest academic qualification, followed by those holding an undergraduate degree (twenty five percent) and a diploma (zero percent). None of them held primary or secondary education as their highest academic qualification. Overall, the respondents were sufficiently qualified to address the demands of the interview.

4.4.2 Profile for the enterprise

The purpose of this section is to establish the characteristics of the business enterprise.

4.4.2.1 Type of business

Table 10 below, outlines the results of the type of business the participants were employed in.

Table 9 : Type of Business.

Type of Business	Percent	Number
Sole Proprietor	0	0
Family Business	0	0
Partnership	25	2
Cooperative	0	0
Private Limited Company	75	6
Total	100	8

Table nine shows that seventy five percent of the businesses represented were private limited companies. This was followed by partnerships (twenty-five); cooperatives (zero percent), family businesses (zero percent) and sole proprietors (zero percent). The sample comprised of mainly two types of businesses drawn from the Australian construction firms. This increased chances of obtaining rich data from across the various types of businesses as the perceptions regarding adoption of a project management information modelling system for building and construction projects may be influenced by the type of organisation under consideration.

4.4.2.2Number of employees

Table ten shows the results on the number of employees in the relevant business organisation's where the participants were employed.

Table 10 : Number of Employees.

Number of Employees	Percent	Number
0 – 25	25	2
26 – 50	50	4
51 – 75	25	2
76 – 100	0	0
Above 100	0	0
Total	100	8

Most of the participants came from firms that had zero to twenty-five employees (twenty five percent). This was followed by twenty-six to fifty employees (fifty percent); fifty-one to seventy-five employees (twenty five percent); seventy-six to hundred employees (zero percent)

and more than hundred employees (zero percent). The sample was drawn from firms of all categories in terms of size, to incorporate the views of both small and large firms in relation to the adoption of a project management information modelling framework for building and construction projects.

4.4.2.3 Number of years operating.

Table 12 shows the results on the number of years the businesses have not been operating.

Table 11 : Number of years operating.

Number of years operating	Percent	Number
Less than 1 year	0	0
1 to 5 years	0	0
6 to 10 years	25	2
11 to 15 years	50	4
Above 15 years	25	2
Total	100	8

Most of the firms were between eleven to fifteen years in operation (fifty percent). This was followed by firms with more than fifteen years in operation (twenty five percent) and those with six to ten years operation in working (twenty five percent). The firms had accumulated reasonable experience in the industry. Therefore, there was a possibility of their employees having been exposed to various systems, hence they could provide valid contributions in relation to a project management information modelling system for building and construction projects.

4.5 IM systems currently used in the project management sector.

The objective sought to determine the extent to which IM systems are currently used in the project management sector within the setting of building and construction projects in Australia, and the barriers thereof.

The participants were required to demonstrate the degree to which their enterprise has ever embraced certain project management information modelling systems. Table twelve shows the results obtained.

Table 12 : Project management information modelling systems

Information modelling system	Number
Building information modelling system	5
Building performance modelling system	1
Building energy modelling system	1
Building environment modeling system	1

The results show that most of the participants' firms utilised the project management information modelling systems to some extent: Building information modelling system (sixty-two and half percent); Building performance modelling system (twelve and half percent); Building energy modelling system (twelve and half percent) and the Building environmental modelling system (twelve and half percent).

4.5.1 Building information modelling system

Though the firms had embraced the project management information modelling systems to a less extent, it is notable that there were some firms that had embraced the systems to a greater extent. To obtain a clear picture, the results were cross tabulated in relation to the type of business. The results obtained are shown in Table 13.

Table 13 : BIM in relation to type of business.

Type of Business	Number
Family Business	0
Partnership	1
Cooperative	0
Private Limited Company	4
Total	5

The results show that a greater number of participants who indicated that Building information modelling system was used to a lesser extent came from the partnership and cooperatives. As for companies, most of the participants cited that the Building information modelling system was being used to a greater extent. Therefore, usage of the Building information modelling

system is inclined towards the type of business, with private limited companies being more inclined towards its use in construction projects.

4.5.2 Building performance modelling system

This section presents results on the use of a Building performance modelling system in relation to the type of organisation. The results gotten are shown in Table 14.

Table 14 : BIM in relation to type of business.

Type of Business	Number
Family Business	0
Partnership	0
Cooperative	0
Private Limited Company	1
Total	1

The results show that most of the participants who noted that Building performance modelling system was being used to a lesser extent came from sole proprietors were none and twelve and half percent of sole proprietors and partnerships (two out of eight). In this research, most the participants in companies cited that the Building information modelling system was being used to a greater extent. Therefore, usage of the Building information modelling system is inclined towards the type of business, with private limited companies being more inclined towards its use in construction work.

4.5.3 Building energy modelling system

This section presents results on the cross tabulation of the use of Building energy modelling system in connection to the type of organisation. The results obtained are shown in Table fifteen.

Table 15 : BEM in relation to type of business.

Type of Business	Number
Family Business	0
Partnership	2
Cooperative	0
Private Limited Company	0
Total	2

The results show that a percentage of participants who indicated they were using the Building energy modelling system to a lesser extent were from cooperatives were none, and partnerships (three out of eight). The results show BEM is adopted only in the partnership structure and, interestingly, not in the cooperative structure. This is possibly an indication that the use of BEM depends on business types. Perhaps the larger cooperative and other business structures have a more focus on construction than building energy simulation modelling.

4.5.4 Building environmental modelling system.

This section presents results on the cross tabulation of the use of Building environmental modelling system in relation to the type of organisation. The results obtained are shown in Table sixteen.

Table 16 : BEM in relation to type of business.

Type of Business	Number
Family Business	0
Partnership	0
Cooperative	0
Private Limited Company	1
Total	1

The results show that indicated that there was one company that was using the Building environmental modelling system (one out of eight). For companies, most the participants cited that the Building information modelling system was being used to a greater extent. Therefore,

usage of the Building information modelling system is inclined towards the type of business, with private limited companies being more inclined towards its use in construction work.

4.6 Key attributes of a perceived PMIMS system.

The participants were required to speak on the key attributes of a perceived PMIMS system necessary for building and construction projects in Australia. Table seventeen shows the results obtained.

Table 17 : Key attributes of a PMIMS system

Key attribute	Frequency	Percent
Effective communication	8	100
User friendly	7	75
Cost saving	7	75
Time saving	8	100
Flexibility	6	70
Stakeholder engagement	8	100
Standalone system	6	70
Risk reduction	6	70

The participants were required to speak on the key attributes of a perceived PMIMS system necessary for building and construction projects in Australia.

The results of the focus group discussion appear that all the members favored a PMIMS system that has effective communication. They preferred a system that enhances effectiveness of communication with stakeholders.

One of the members, amid the focus group talks said:

"*According to me the information systems that are talked about in the interviews are correct and I think they are very applicable when it comes to project management." (Focus group respondent)*

Furthermore, respondent one said:

"I also definitely think that the results that are obtained from the proposed adoption of the project management information modelling system will definitely increase the project performance in terms of time spent on the project the quality and the general costs of the project" (Focus group respondent 1)

This information is required in its wholeness to enable a proper decision to be taken by the relevant stakeholders. Provision of complete information is crucial as the stakeholder will have

no need to always seek clarification; rather a decision can be taken based on the information provided. They also highlighted the need for effective communication in a timely manner. It was noted that information provided at the appropriate time would be more valuable than information provided and would be used to make used for relevant decisions in projects.

Seventy five percent of the participants cited the importance of a user-friendly system. This idea was based on the notion that the usefulness of a system relies on the ability of users to derive value from it through its effective use. Focus group results also indicate that a useful PMIMS should be a simple information modelling system that is not complicated; otherwise, users may find it difficult to explore its usefulness. This suggests that PMIMS systems should be capable of executing intended functions in a manner that is capable of being understood by users, though not compromising on quality.

"In terms of for the outcome whether this will extend the project life cycle from the stages of initiation learning project definition documentation as well is disposal and it is difficult for me to really say whether it will increase or not but from what I've seen and from what I've heard other people seeing person to speak before me I think it will definitely increase the stages of project management" (Focus group respondent 2)

It was noted that the potential for attaining cost saving was noted by seventy five percent of the participants. It was noted that the drive to embrace technology-based applications is often driven by the desire to reduce project costs.

"The adoption of this recommendation I think you're in my view into your paws in terms of execution of projects are in terms of time the cost within the quality of the projects and remember most of the project that we do our construction so I think this will definitely increase the production of quality projects and done in time and of good quality and its reasonable cost".

(Focus group respondent 3)

This factor was also highlighted by focus group discussion wherein it was indicated that PMIMS systems ought to be capable of ensuring project completion within specified budgets and mitigate cases of unexpected increases in costs. This indicates that PMIM systems should help to avoid cost overruns, though this factor should not compromise efforts to have a better-quality project.

"In my view I will definitely embrace the recommendation for adoption of a PMIM system. I also definitely think that the results that are obtained for the adoption of the project management information modelling system will definitely increase the project Performance

intends of time spent on the project the quality and the general costs of the project." (Focus group respondent 4)

The results also highlighted the eight of the research participants were concerned with the need for flexibility within the current information system. Focus group results indicate that effective information management software should be able to address a specific organisation and specific project's information needs.

They suggested that the system should be capable of being adjusted to suit a project team's needs rather than adjusting project team's needs to suit the system:

"In my view the proposal to embrace the recommendation in the adoption of this project management information modelling system is a novel idea and I think most people will also like it because we are going into the 21st-century now and things surely have to change project management is always stayed behind and has never moved from the early 80s until now." (Focus group respondent 6)

Systems that can be customised to meet current project needs are said to be flexible as they can suit different project requirements without losing their functionality and usefulness. This makes it possible for the construction firm to utilise the same system to manage the execution of either small or large projects without the need to procure or develop alternative systems. Therefore, flexibility within the PMIM system enhances cost saving and attainment of value for money for the business organisations.

One hundred percent of the eight participants highlighted the need for a system that facilitates stakeholder engagement. This is derived from the view that project success is subordinate on the endeavors and collaboration of significant partners, consequently it is basic for the company to be able to effectively coordinate their effort. The need for stakeholder engagement was also suggested by interview results as it was noted that stakeholder activities may delay project success with detrimental results to overall project outcomes:

"Also, the major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is done punctually making sure visual aids are included making sure there is a flawless communication channel amid stake holders and the client." (Focus group respondent 8)

According to focus group respondent 8, information management systems should be capable of providing updates and reminders to concerned stakeholders so that they may deliver up to the project plans. This is attainable through clear identification and engagement of these stakeholders at the earliest possible moment during the life of the project execution. There is need for timely provision of information and constant interaction through provision of updates

and any changes to project milestones. Also, such project management systems should allow stakeholder interaction such that they may query the system which is expected to provide the required information.

Most of the focus group respondents noted the importance of a system that can be standalone, without the need to rely on other platforms and applications. Focus group results confirmed the need for such software which should; *"…. It is also important to see how our people kept on talking about some issues especially about the adoption of the new system of project management". (Focus group respondent 6).*

Furthermore, it was mentioned during the focus group discussion that the systems in use currently depended on other applications for tasks such as, risk management, cost management and report generation. Additionally, focus group respondent five said, *this only save on the investment cost, but rather it is enhancing security of information, so then there is no need for information sharing between software.*

Furthermore, participants noted the need for time saving, a working system was thought to help completion of projects within specified time schedules as this would enhance organisational productivity. Analogous results were obtained from the focus group discussion wherein it was highlighted that time performance is often crucial for both the client and the contractor as well as other stakeholders for a project. This helps to reduce disputes in construction projects amongst the aforesaid stakeholders. The delivery time of a project may be a key figure to the owner in terms of fetched as much because it is for the contractor.

The results show that all the participants preferred a PMIMS system that has effective communication (hundred percent). They preferred a system that enhances effectiveness of communication with stakeholders. This view was supported by interviews conducted as it was noted that:

"… project management information modelling system should ensure that the communication is done promptly making sure there is a clear communication channel between stakeholders, and this is attainable by developing simple information modelling system, which is not complicated, but one that is user friendly" (Interviewee 5)

Such information is required in its completeness to enable a proper decision to be taken by the relevant stakeholders. Provision of complete information is crucial as the stakeholder will have no need to always seek clarification; rather a decision can be taken based on the information provided. They also highlighted the need for effective communication in a timely manner. It was noted that information provided at the appropriate time would be more valuable than information provided and would be used to make used for relevant decisions in projects.

Seventy five percent of the participants cited the importance of a user-friendly system. This idea was based on the notion that the usefulness of a system relies on the ability of users to derive value from it through its effective use. Interview results also indicate that a useful PMIMS should be a simple information modelling system that is not complicated; otherwise, users may find it difficult to explore its usefulness. This suggests that PMIMS systems should be capable of executing intended functions in a manner that is capable of being understood by users, though not compromising on quality.

The potential for attaining cost saving was noted by seventy five percent of the participants. It was noted that the drive to embrace technology-based applications is often driven by the desire to reduce project costs. This factor was also highlighted by interviews wherein it was indicated that PMIMS systems ought to be capable of ensuring project completion within specified budgets and mitigate cases of unexpected increases in costs. This indicates that PMIMS systems should help to avoid cost overruns, though this factor should not compromise efforts to have a better-quality project.

The results also highlighted the eight of the research participants were concerned with the need for flexibility within the PMIMS system. Interview results indicate that effective information management software should be able to *"address a specific organisation and specific project's*

information needs" (Interviewee six). They suggested that the system should be capable of being adjusted to suit a project team's needs rather than adjusting project team's needs to suit the system.

Systems that can be customised to meet current project needs are said to be flexible as they can suit different project requirements without losing their functionality and usefulness. This makes it possible for the construction firm to utilise the same system to manage the execution of either small or large projects without the need to procure or develop alternative systems. Therefore, flexibility within the PMIMS systems enhances cost saving and attainment of value for money for the business organisation's.

Hundred percent of the participants highlighted the need for a system that facilitates stakeholder engagement. This is derived from the view that project success is dependent on the endeavors and collaboration of important partners, thus it is basic for the company to be able to effectively coordinate their effort. The need for stakeholder engagement was also suggested by interview results as it was noted that *"stakeholder activities may delay project success with detrimental results to overall project outcomes"* (Interviewee eight). Therefore, information management systems should be capable of providing updates and reminders to concerned stakeholders so that they may deliver up to the project plans. This is attainable through clear identification and engagement of these stakeholders at the earliest possible moment during the life of the project execution. There is need for timely provision of information and constant interaction through provision of updates and any changes to project milestones. Also, such project management systems should allow stakeholder interaction such that they may query the system which is expected to provide the required information.

Seventy percent of the participants noted the importance of a system that can be standalone, without the need to rely on other platforms and applications. Interview results confirmed the need for such software which should; *"...cater for information needs from initiation until the end of the project life cycle that's until the demolition stages"* (Interviewee two).

It was mentioned by interviewee two that the systems in use currently depended on other applications for tasks such as, risk management, cost management and report generation. Additionally, Interviewee two said, this only save on the investment cost, but rather it is enhancing security of information, so then there is no need for information sharing between software.

All the participants noted the need for time saving (hundred percent). A working system was thought to help completion of projects within specified time schedules as this enhances organisational productivity. Similar results were obtained from interviews wherein it was highlighted that time performance is often crucial for both the client and the contractor as well as other stakeholders for a project. This helps to reduce disputes in construction projects amongst the aforesaid stakeholders. The delivery time of a project is a key factor to the owner in terms of cost as much as it is for the contractor. One of the main interesting outcomes is that interviewees did not consider PMIMs for risk management even though in objective of PMIMs is arguably expected to facilitate robust management of project and consequently the involved risk.

4.6.1 Other information modeling systems for construction projects according to participants.

Several IM systems were indicated by the interview participants as being in use within the Australian construction project management sector.

4.6.1.1 Excel

Roger (2019), in his journal paper for project management provides an insight of how excel has been of so much use in the project management sector and how it managed to balance the "iron triangle" over more than five decades ago, and this has become the underpinning and cornerstone of the project management fraternity. Roger (2019) says that companies were utilising Microsoft excel and other excel supported applications for their project management activities prior to their migration onto some custom-made software but for larger construction projects, Excel could be "imperfect" as it could effectively support only small projects.

The use of Excel was being increasingly abandoned amongst many construction firms in Australia. (Interviewee one). This was largely attributed to the need to develop systems and applications that directly cater for individual corporate needs. Excel based applications were considered too open and general for usability in various projects. (Interviewee one).

Given technological advancements, it became necessary for project management to undergo a revolution whereby traditional project planning solutions that rely on manual procedures for report generation and updating with recent information, are set aside for more flexible systems.

Therefore, several systems have been developed and some of those identified include Accelo, Maven link, Liquid Planner, Wrike, Freshdesk and ASANA (Interviewee one).

4.6.1.2 Accelo

Lohmeyer (2017) says that the use of Accelo for project management enables the users to be used even for interaction with other project team members using its cloud-based systems.

Accelo was said to be automated and capable of being integrated with other applications, for instance, it could be linked to Excel client accounts, project timesheets which facilitates real time communication with several stakeholders by interlinking systems (Lohmeyer 2017).

The results show that one company used a software called Accelo which was customised to suite its requirements (Interviewee two). This was said to be compatible with Building Information Modelling Systems (BIM), hence its applicability in most building and construction projects all around Australia. It also helps to track project progress such that the business may spend less time in meetings and dealing with administration work.

"*Accelo is very handy for planning, but when looking at information sharing, or information transfer we find out it is not very useful and that is when we change to BIM"* (Interviewee two).

Regarding its usefulness, the participants indicated that Accelo facilitates interaction with the users who can query the system on required information which is easily provided. This enhances project progress tracking and enhances the decision-making process. Such interoperability enhances streamlining of operations so that the users may dedicate their full attention to their client. Consequently, users can be confident when executing project tasks and become more productive.

However, the participants cited the shortcomings of the Accelo software as encompassing being *"not very user friendly for other project stakeholders who may have not received training on its use as they may be utilising other software like BIM or other project management information systems"* (Interviewee two). This is emanated from the complexity of the system which some stakeholders find too complicated than what they are currently using. Furthermore, Accelo was however identified as incapable of executing all information management from initiation to project completion without relying on other applications, which increases the costs of investing in more than one software and to manage projects. According to Interviewee 1,

transfer, and share information amongst more than one system increases the risk of information loss and data manipulation which jeopardises information security.

4.6.1.3 Maven link

Esteves (2018), says Maven link was derived from the business perspective and is handy for project managers and to use on most the project management tools. This software is desirable for export compatibility which makes it easier to coordinate with other platforms, thus, report generation becomes easier and information can be exported to programs like accounting packages such as QuickBooks (Guemazi 2017).

Maven link, a software developed by their company to suit their needs was identified within the Australian construction industry. (Interviewee three). This software was developed so that it caters for project management resource planning and other functionalities such as task scheduling, time planning, financial and cost management.

"*Like I said before, Maven link is a software for project management solutions, resource planning and things like that but the expediency of it every moment is a bit tricky even though it is you undertaking the job; it is the one that we're using on two day to day basis, that is cost management, time in planning, all the sort of things."* (Interviewee three)

Maven link was found desirable for its capability to enhance project cost tracking so that project teams can work within specified budgets (Interviewee three).

On the other hand, the results show that Maven link software is not without its limitations. It was indicated that Maven link depended on *"…other systems for the attainment of total effectiveness in information management up to completion"* (Interviewee four). Other applications which are more technical in project planning and tracking would be required, given that Maven link was more effective in cost tracking and financial management. This adds to the overall investment appreciation and decreases the need for compatibility of multiple software to avoid disruptions in the exchange and sharing of information (Interviewee 3).

4.6.1.4 Liquid planner

According to Telerman (2018), Liquid planner is identified as a project management software in use and is used as a predictive project management software suitable for modern business due to its compatibility with Building Information Modelling Systems (BIM).

It was noted that technological advancements have necessitated increased use of predictive analysis based on artificial intelligence and predictive technology, As such, the Liquid planner is developed based on predictive technology, which increases its chances of producing better project plans (Telerman 2018).

"*The world today mostly relies on predictive planning technology. The other thing about liquid planner is that it can be able to give you a better plan. We have about 200 people in our organisation and we sometimes do many projects at a time, it is a good project management software."* (Interviewee four)

Liquid planner is a multifaceted system capable of handling information of several bigger projects at once. This was noted as one of the companies represented had *"…more than 200 people and sometimes conducted at least 10 projects at a time"*, supported by the Liquid planner (Interviewee four). Liquid planner being a sophisticated system, it can quickly process several commands in a short period of time. However, this comes with the need for intensified training for the system to become useful within the organisation. This increases time required before one becomes productive using the system, adding to the overall project costs.

Some limitations of the Liquid planner software were identified as encompassing, "*inter alia",* challenges in the system *"…the biggest challenge now is management of work software breakdowns"* (Interviewee four). This was found to be critical especially in cases when there is a need to convert from one level of project progress to the other. This implies that the Liquid planner was not capable of handling all information management from project initiation up to completion for multiple projects. Although using predictive technology, some interfaces require regular updating to allow easier navigation from one project to another.

4.6.1.5 Wrike

According to Jansson (2016), some companies were using Wrike project management software within the Australian construction industry, and it was mainly utilised for its flexibility and collaborative tools needed for delivering efficient and timely projects. It was noted that the Wrike software was also available for users even when they are anywhere offline and functions like 'my live editor' and 'real time comments' enables communication even if some user is offline (Jansson 2016).

"Collaborates on tasks using my live editor and sound real time comments, enabling so much communication without breaking down and preventing anyone from getting disabled once offline" (Interviewee six)

Using this software, users are kept posted with latest tasks completed and an option for them to give feedback using a proofing system. *"…reduces confusion and makes the review process quick and easy after all the feedback has been addressed"* (Interviewee six). Once a task is approved and executed, progress can be checked so that any potential issues that might create unnecessary delay are identified and corrected while also keeping all stakeholders informed.

On the other hand, the Wrike software was criticised for its incapability to effectively work with many users simultaneously. It was noted that *"Wrike is currently usable for the current number of fifteen, yet it may probably have challenges if there are more than twenty users at once"* (Interviewee six). For many users within a company, they have sometimes do not log in to avoid disrupting other users' work. It was also observed that the major challenge of the Wrike software pertained to its incapability *to "…to operate on its own without other players like BIM"* (Interviewee six). The Wrike software was found to be unable to work from the beginning to the end without incorporating other software.

4.6.1.6 Freshdesk

According to Interviewee seven, Freshdesk is another software identified as useful for project management. Freshdesk is cloud based and normally works with the support of a technical team (Interviewee seven). The Freshdesk is equipped with functionalities such as smart automation and has the option for frequently asked questions to enhance information availability and communication of project information (Interviewee seven). It has a simple and smart interface which can be integrated with social networking sites to enhance stakeholder engagement. This system can be set to automatically update databases when there are any new changes happening across the activities of a project team (Interviewee seven). Freshdesk is more desirable when compared to traditional spreadsheets. There is a facility to customise the system so that unnecessary information is filtered, though not discarded, to enable project team members to easily access information that is crucial for their decisions (Interviewee seven).

However, the Freshdesk had some limitations noted by the participants, *"…inability to interact with the project team especially like the assigning of emails and sending emails from the correct department to the correct person in the other department"* (Interviewee seven). Since

the system is based on a cloud platform, it is easily accessible by the project team members who can forward and receive information and emails through the Freshdesk platform.

The Freshdesk system also has a function which permits auto saving of information being sent to other project team members and stakeholders. For instance, a user who *"…fails to hit a forward button after preparing their message is bound to lose such information as the process is almost impossible to reverse"* (Interviewee seven). Therefore, the system requires great experience and knowhow, lest users may lose hard compiled information in just a split second, to the detriment of the overall project coordination and completion.

4.6.1.7 ASANA

According to Adams (2018), ASANA as another project management system used to find and coordinate the company's teams in projects such as marketing design and human resources With ASANA, there is even more tabs to see the work organized within the way that works best for users, and additional parts of the tabs let them access all the product information needed (Adams 2018).

"Asana can be used to run in entire organisation's making it easy for all teams to better collaborate amongst themselves and with each other" (Interviewee eight)

This helps to facilitate conversations instead of an email chain for communication which enhances information availability to concerned stakeholders while guaranteeing information security. (Interviewee eight)

4.7 Conclusion from the analysis interviewees themes

According to the themes and key words drawn from interviewees, indeed there is a possibility for the recommendation of development adoption and implementation of a project management information modelling system which might lead better project outcomes within the context of building and construction projects in Australia. The researcher scrutinised through literature review the information modelling systems (IMs) currently used in the project management sector in the building and construction projects in Australia such as BIM, BPM BEM, Accelo, Asana and many more.

The researcher established the key possible attributes, challenges, advantages, and disadvantages of such a PMIMS system for building and construction projects in Australia and how the perceived Project Management Information Modelling (PMIMS), could increase potential to usher in an era of enhanced project management within the building and construction sector in Australia in terms of time cost and quality of projects.

Additionally, the researcher noted from the interviewees that building and construction sector is faced with innumerable challenges concerning project management; chiefly those challenges associated with the adoption of general information modelling systems (IMs). Furthermore, it was agreed by all the interviewees that the current IMs are limited and therefore there is a strong urge for the recommendation for a formulation of a PMIMS and adoption, in order to achieve better outcomes of project management in the construction and building sector in Australia.

Likewise, the interviewees agreed with the researcher to seek and propose a PMIMS system tailor-made for Australian construction firms and examine the possible PMIMS adoption among Australian project managers.

Furthermore, from the themes and key word drawn from the interviews, it was deduced that in spite of the increasing use of IM systems in the building and construction industries, there are still significant project failures in upstream and downstream into all phases of the project management cycles might provide processes.

From the themes and key word drawn from the interviews, and analysed data, it is suggested that there has been a communication gap in the design and delivery systems between project

sponsors, project managers, design consultants, contractors, and other team members in construction projects leading to considerable inefficiencies.

Finally, from the themes and key word drawn from the interviews, there is a possibility for the development adoption and implementation of a project management information modelling system (PMIMS) to supply better extend results within the context of building and construction projects in Australia.

4.8 Hindrances to the adoption and implementation of PMIMS systems

This section presents results obtained on the possible hindrances to the organisation's possible adoption and implementation of project management information modelling systems.

From the themes and key word drawn from the interviews, the adoption and implementation of PMIMS systems could by the general slow uptake of new products in the market. These results also show that the organisations were not concerned with the costs associated with the adoption and implementation of PMIMS systems.

The results also do not show doubts about return on the investment and Supply chain buy-in. These results suggest that the organisations were concerned with the environment they were operating in. They viewed their working environment as supportive of the adoption and implementation of PMIMS systems given the challenges they face every day.

Lastly, the results from the analysis show that there was a not much impact of a possible PMIMS change staff resistance and ICT illiteracy. While these factors were considered necessary for a decision, they were found to have a temperate influence on PMIMS systems' adoption.

CHAPTER 5: FOCUS GROUP

5.1 Introduction

A focus group could be a frame of qualitative research whereby a bunch of individuals asked about what they think about is certain product, their opinions, their attitudes towards a service or their belief that your advertisement. The term focus group was first used the psychologist NS Henry (2018) and arose from discussions with social workers student's health workers where Henry and his friend in different backgrounds and different ideas. Although focus groups have a lot of advantages some people think that it is disadvantageous especially when it comes to mixed groups in which some people are young and others older, some have of different backgrounds and some are less educated than others. One of the disadvantages is that the researcher has less control over than one on one interviews as time can be lost through irrelevant discussions (Morgan, D. & Krueger R. 2018).

Since the focus group is a qualitative method, it involves in-depth information and the perceptions and the insights of the of the group participants. One of the one aim is to answer more than one question from different participants and amongst themselves.
The objective of this focus group was to verify the results that the researcher found from all the interviews that we carried out. These results were objectively looked at, discussed, and come up with an overall answer to all the questions and to all the suggestions that were obtained during the focus group discussion.

This researcher conducted a focus group discourse with eight individuals who are built up and experienced project managers who have been within the industry for a long time. This focus group meeting was conducted online via zoom platform.
This researcher explained the background of the discussion and the results that were obtained during interviews before conducting focus group discussions. Each person was asked to speak for about 10 to 15 minutes.
Some researchers still debate whether focus groups are simply a way of adding a shopping list and a list of potential methods to get answers or an idea that has been promoted by traditional market research practices depending on their source of the information (Morgan, D. & Krueger, R. 2018).

Some people say that it is therefore important to approach focus group with the close scepticism constantly asking questions and without challenging the traditional knowledge source of knowledge and practices (NS Henry 2013).
The main objective of this focus group is to promote and to enable a comfortable atmosphere to be able to disclose ideas and make it open for people to share ideas experiences about a topic of tissues and so on and so on.

They are many benefits for using focus groups and discussions and one of them being able to produce the data insights that would not have been easily accessible without the introduction of a group and people listening to others especially with the immense experiences, memories, and ideas in the project management fraternity (Henry, 2013).
This method has a group effect advantage where members engage in a certain type of topic and a kind of chaining or cascading effect talking about links into tumbles of their experiences in the project management guild.
A focus group discussion also enables some form of one language in a positive language and speech to understand each other and come to an understanding about one topic or an idea.

5.2 Summary of main study findings

Considering to the themes and key words drawn from the focus group, indeed there is a possibility for the recommendation of development adoption and implementation of a project management information modelling system which might lead better project outcomes in the context of building and construction projects in Australia.

The researcher established the key possible attributes, challenges, advantages, and disadvantages of such a PMIMS framework for building and development projects in Australia and how the perceived Project Management Information Modelling (PMIMS), could increase potential to usher in an era of enhanced project management within the building and construction sector in Australia in terms of time cost and quality of projects.

Additionally, the researcher noted from the focus group that the building and construction sector is faced with innumerable challenges concerning project management; chiefly those challenges associated with the adoption of general information modelling systems (IMs). Furthermore, it was agreed by the focus group that the current IMs are limited and therefore

there is an urge for the recommendation for a formulation of a PMIMS and adoption, to attain better outcomes of project management within the construction and building sector in Australia. Likewise, the focus group agreed with the researcher to seek and propose a PMIMS system tailor-made for Australian construction firms and examine the possible PMIMS adoption among Australian project managers.

Furthermore, from the themes and key word drawn from the focus group participants, it was deduced that in spite of the increasing use of IM systems in the building and construction industries, there are still significant project challenges in both upstream and downstream to all phases of the project management cycles might provide processes. From the themes and key words drawn from the focus group, and analysed data, it is suggested that there has been a communication gap in the design and delivery systems between project sponsors, project managers, design consultants, contractors, and other team members in construction projects leading to considerable inefficiencies.

Finally, from the themes and key word drawn from the group participants, there is a possibility for the development adoption and implementation of a project management information modelling system (PMIMS) to supply better extend results within the setting of building and development projects in Australia.

5.3 Focus group questions

1. What is your view regarding the interviews results concurred that there less utilisation of IM systems amongst the construction firms in the project management fraternity?
2. What is your view regarding the proposal to embrace the recommendation for adoption of a PMIM system?
3. What is your view regarding that interviews results which established that PMIM system adoption would improve the projects performance, in terms of time, cost and quality?
4. What is your view regarding the interview's outcome that a proposed PMIM would extend a project life cycle that have stages that start from initiation, planning, project definition, documentation, delivery until disposal?

5.4 Results and interpretation of focus group discussion

5.4.1 Introduction

This section presents the results and interpretation of focus group discussion. Primary data for the study with the project managers of selected organisations within the building and construction sector in Australia. Data from the focus group discussion was presented in tabular form and analysed using Nvivo by means frequencies of words spoken, common words spoken and percentages. This was compared using information obtained from the initial interviews which was carried out with key informants from ten selected large firms in the same sector. This focus group meeting was conducted online via Zoom platform.

5.4.2 Response rate analysis

This section outlines the response rate of the discussions as this has a bearing on the validity and reliability of the data. Table 21 presents the results on the response rate analysis.

Table 18: Source: primary data

	Target number	**Frequency**	**Percent**
focus group discussion number of participants	8	8	100

All the eight planned discussions were successful. The attained response rate was considered adequate to validate the research in line with what was suggested by Sekaran & Bougie(2000) that a thirty percent response rate validates a research.

Figure 20 depicts the analysis of the focus group discussion using various forms such as word cloud, similar words analysis and commonly spoken words using Nvivo and analysing the ways which these particular words are connected to each other from the words that came out amid the focus group discussion. The twine ball showed the words that were commonly spoken during the focus group discussion and how they are

intertwined together. Some of the words include, ***attributes, better, change, date, disposal, feel, finish, good, improvement, initiation, life, need, order, project, quality, recommendation, terms, time, view, change, channel, communication, delivery, expect, extend, give, group, indication, information, order, people, person, production, program, project, proposal, report, saying, speak, stake, start and time.***

Although some participants might not have used the exact same words but synonyms that form part of the integral research question. It is imperative to note that the common words and most spoken that were derived from this focus group discussion were ***adoption of this project management information modelling help cost, improve time, quality, useful and increase results.***

Figure 17: Results from analysing word cloud using Nvivo.

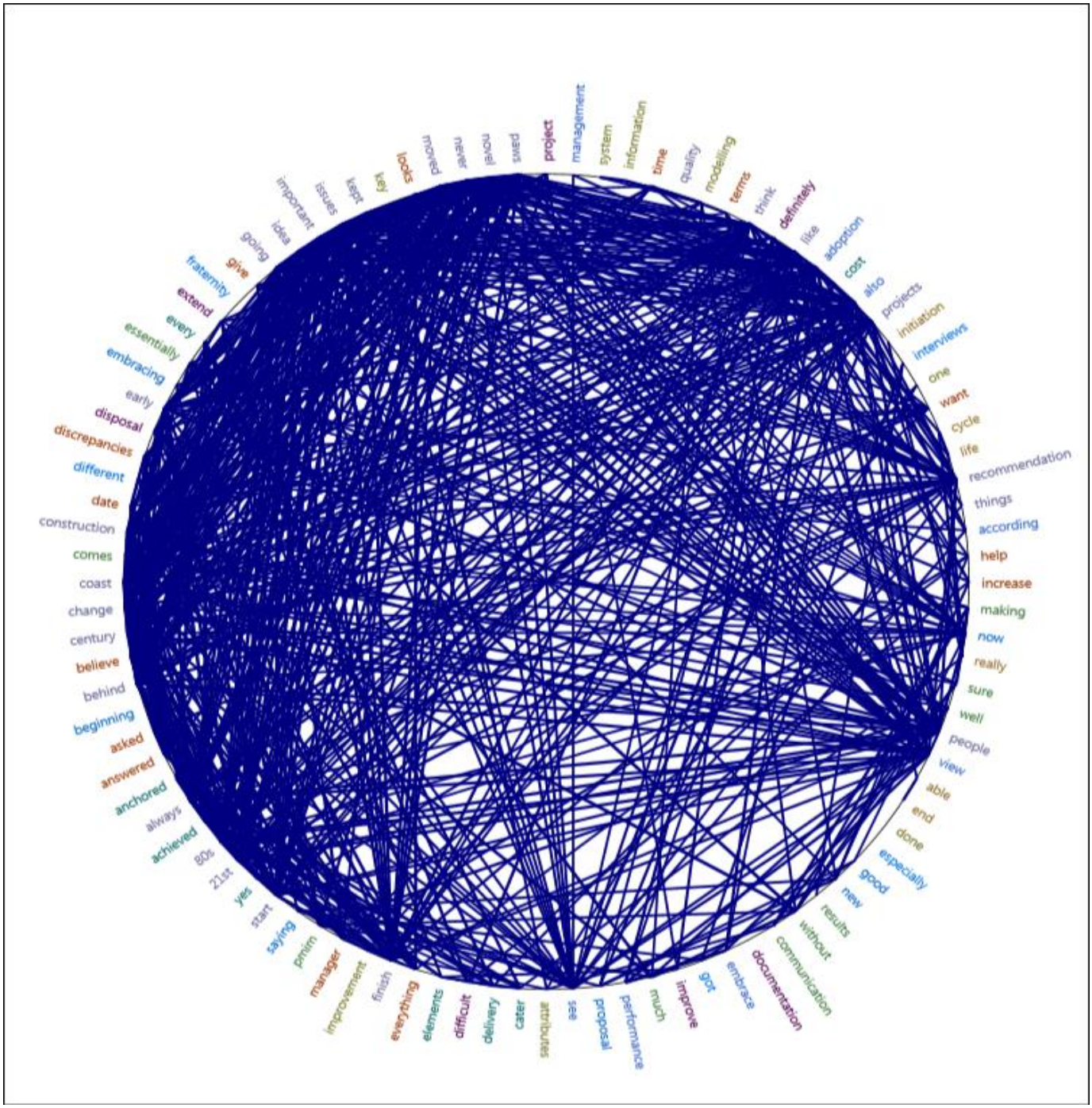

Figure 18: Results from analysing commonly spoken words using Nvivo.

Figures19 depict the analysis of the focus group discussion using various forms such as using Nvivo and analysing the ways which these particular words are intermarried in form a twine ball from each and every of the eight participants during the focus group discussion. The twine ball showed the words that were commonly spoken during the focus group discussion and how

they are intertwined together. Some of the words include, ***attributes, better, change, date, disposal, feel, finish, good, improvement, initiation, life, need, order, project, quality, recommendation, terms, time, view***, ***change, channel, communication, delivery, expect, extend, give, group, indication, information, order, people, person, production, program, project, proposal, report, saying, speak, stake, start and time.***

After transcribing, Nvivo research analysing software also enabled the researcher to find out what number of participants spoke how many words during focus group discussion, the percentage frequency of the similar words, and which particular words were spoken most. Table 22 portrays the analysis using commonly spoken words and their percentage frequencies. It is of great value to also note that most of these words consist of most of the words pointed out when the initial interviews were conducted by the researcher.

Table 19: Results from analysing similar words using Nvivo.

Word	Length	Count	Weighted Percentage (%)	Similar Words
attributes	10	209	3.17	attributes, better, change, date, disposal, feel, finish, good, improvement, initiation, life, need, order, project, quality, recommendation, terms, time, view
communication	13	201	2.69	change, channel, communication, delivery, expect, extend, give, group, indication, information, order, people, person, production, program, project, proposal, report, saying, speak, stake, start, time, transfer, view, want
channel	7	114	2.42	channel, communication, make, management, project, take, track, transfer
project	7	104	2.41	cause, channel, construction, plan, program, project, projects, proposal, proposed, seeing, transfer, visual, work
change	6	158	2.38	beginning, better, change, closing, coast, contribute, correct, delivery, even, extend, feather, feel, finish, focus, give, going, happening, help, improve, improvement, increase, initiation, know, lose, make, opening, outcome, people, realize, stake, start, take, think, time, transfer, true, work

think	5	182	2.29	believe, change, construction, embrace, expect, feel, focus, give, idea, intends, know, like, make, means, order, plan, program, project, reasonable, remember, take, think, thought, time, view
management	10	51	2.11	achieved, disposal, give, make, management, manager, managers, order, work
definitely	10	21	1.99	absolutely, definitely
things	6	66	1.95	behind, change, channel, couple, group, happening, need, system, things, want
quality	7	129	1.88	better, change, cost, definition, disposal, finish, focus, good, help, making, quality, recommendation, start, system, view
program	7	141	1.77	idea, information, performance, plan, program, project, software, system, thought
making	6	174	1.75	cause, change, construction, expect, fire, give, help, make, making, plan, production, program, project, realise, start, take, think, time, track, view, work
cost	4	47	1.66	assessment, cost, costing, costs, need, take, terms, valuation
happened	8	88	1.44	beginning, cause, change, cycle, delivery, example, finish, fire, give, going, happened, happening, improvement, increase, opening, outcome, report, start, success, time
plan	4	152	1.44	plan, program, project, system, think, thought, time
terms	5	75	1.39	cost, life, terms, time, valuation
idea	4	142	1.38	beginning, example, idea, plan, program, project, quality, system, thought, view
also	4	14	1.36	also
moved	5	113	1.32	cause, change, channel, closing, coast, date, feather, finish, fire, give, group, make, moved, opening, order, project, speak, stake, start, take, transfer, work
adoption	8	29	1.30	adoption, change, embrace, embraced, embracing, take
help	4	38	1.27	adoption, aids, better, cater, help, improve, work
group	5	74	1.26	fair, fraternity, group, information, order, people, system

interviews	10	14	1.22	interviews, questions
information	11	77	1.13	change, documentation, example, general, give, indication, information, program, report, time, track
going	5	50	1.10	change, coast, correct, cycle, extend, finish, going, make, moved, take, track, transfer, well, work
view	4	64	1.04	believe, coast, expect, idea, like, looking, make, seeing, think, thought, view, views
give	4	63	0.99	cater, change, contribute, date, disposal, extend, fire, give, help, make, opening, remember, thank, think, transfer
results	7	21	0.99	answered, change, finish, issues, outcome, results, solutions
report	6	39	0.93	according, information, report
documentation	13	29	0.89	communication, documentation, order, program, report, software, transfer, well
really	6	9	0.88	really
proposal	8	44	0.86	example, indication, proposal, proposed, recommendation, take, think
like	4	39	0.83	comparatively, correspondingly, like, probably, view, want
useful	6	47	0.82	extend, give, help, quality, take, useful, using, work
work	4	87	0.79	cause, help, learning, make, production, project, take, work
sure	4	14	0.78	sure, surely, true
person	6	41	0.77	better, cause, change, client, date, general, help, life, major, manager, person, success, transfer
production	10	25	0.72	good, making, novel, outcome, production, successful, work
finish	6	15	0.70	closing, done, finish, happening, outcome
system	6	41	0.69	general, group, order, plan, program, system, systems
able	4	7	0.68	able
construction	12	52	0.68	beginning, construction, idea, like, make, quality, thought
example	7	57	0.68	example, happening, information, time
asked	5	24	0.64	asked, cost, expect, need, order, take
stages	6	37	0.64	production, stages, system
elements	8	14	0.62	elements, fire, making
extend	6	25	0.62	change, extend, extending, give, going, increase, long

initiation	10	33	0.61	beginning, cause, initiation, make, opening, people, start, starts
essentially	11	18	0.60	essentially, important, need, want
cause	5	38	0.59	better, cause, client, help, initiation, life, person, success, transfer
difficult	9	27	0.58	difficult, quality
especially	10	6	0.58	especially
true	4	13	0.58	even, sure, true
feel	4	43	0.57	believe, feel, fire, idea, lose, think, thought, want
want	4	30	0.57	like, long, need, want
transfer	8	38	0.56	cater, change, contribute, date, delivery, extend, fire, give, help, learning, person, realise, transfer
reasonable	10	38	0.54	cause, fair, feel, give, group, indication, make, reasonable, think, thought
correct	7	60	0.52	change, correct, focus, improvement, quality, time
looks	5	19	0.52	expect, feel, looking, looks, make, seeing, view
talking	7	6	0.51	speak, talked, talking
order	5	18	0.50	cycle, fraternity, make, opening, order
different	9	29	0.49	change, different, quality
much	4	5	0.49	much
time	4	45	0.48	correct, date, example, indication, life, time
improve	7	24	0.46	better, change, help, improve, improvement, improving
according	9	12	0.45	according, give
comes	5	15	0.45	change, closing, comes, extend, fair, make
know	4	32	0.45	couple, feel, know, learning, realise, remember, take, think
start	5	25	0.45	beginning, going, initiation, opening, start, starts
achieved	8	16	0.43	achieved, going, make, performance, person, success, successful
general	7	34	0.43	general, idea, overall, quality, speak, thought, transfer
included	8	15	0.43	embrace, included, view
payments	8	16	0.39	cost, payments
everything	10	4	0.39	everything
believe	7	30	0.38	believe, expect, probably, quality
closing	7	36	0.38	closing, finish, good, means, quality
well	4	15	0.38	good, well
life	4	39	0.36	life, need, person, time

increase	8	19	0.33	change, enhanced, extend, give, increase
important	9	13	0.30	focus, good, important, means, transfer
need	4	22	0.30	life, need, want
stayed	6	4	0.30	order, stayed
excel	5	24	0.28	excel, quality
questions	9	8	0.27	proposal, questions
better	6	13	0.24	better, good, improvement, major
enhanced	8	11	0.23	better, enhanced, improve, improvement
flawless	8	6	0.23	finish, flawless
saying	6	10	0.23	give, order, saying, take
applicable	10	5	0.22	applicable, person, program
obtained	8	7	0.22	change, obtained, take
issues	6	10	0.21	beginning, issues, opening, take
performance	11	12	0.20	give, make, performance, program
practicing	10	4	0.20	practicing, take
take	4	15	0.18	channel, finish, know, learning, need, take, track, work
visual	6	13	0.18	change, view, visual
answered	8	5	0.16	answered, work
harmoniously	12	4	0.15	harmoniously, order, true
optimal	7	5	0.15	improvement, optimal
beginning	9	13	0.14	beginning, cause, happening, opening, speak, start
opening	7	13	0.12	beginning, give, opening, person, start
collaborating	13	3	0.11	collaborating, work
professionally	14	4	0.11	change, professionally
disadvantages	13	1	0.10	disadvantages
success	7	7	0.10	happening, opening, order, success, successful
realise	7	6	0.08	know, make, realise, seeing
date	4	4	0.06	date, seeing
learning	8	6	0.06	learning, seeing, transfer, work
solutions	9	2	0.06	solutions, success
fire	4	5	0.05	fire, happening, make
seeing	6	5	0.05	feel, know, seeing, take

These commonly spoken words, word frequencies and word percentages words that came from the focus group discussion concurred that there should be a recommendation of the adoption that came out amid the focus group discussion. The results showed the management fraternity in Australia, could improve project delivery in terms of time cost and quality.

CHAPTER 6: CONCLUSIONS AND RECOMENDATIONS

6.1 Introduction

This chapter presents the rundown of the results gotten from the initial interviews and focus group discussions regarding the recommendation for adoption and implementation of a PMIM system within Australian construction companies, drawn from the initial research objectives. It also provides the conclusions deduced and recommendations which evolved from this study. Summary and conclusions are presented using thematic analysis, in line with research objectives, while recommendations were provided to relevant stakeholders.

6.2 Summary research objectives and conclusions

The conclusions were derived from the summary in line with the themes in the research objectives.

1. To investigate, identify deficiencies in the current Information Modelling (IM) systems and ascertain whether there is a possibility for a recommendation for the adoption and implementation of a project management information modelling system PMIMS to provide better project outcomes in the construction projects in Australia.
2. To ascertain the extent of and utilize of IM systems within the project management sector within the context of building and construction projects in Australia.
3. To determine how the IM systems are currently viewed in the project management sector within the context of building and construction projects in Australia.

6.2.1 Conclusions from the main research question.

The research question seeks to determine whether project managers could better utilise IM systems to achieve more desirable project outcomes for building and construction projects in Australia, From the research that the researcher did, the research further discovered that there was less utilisation of IM systems amongst the project managers in construction firms.

It was also important to discover during research that, while construction companies were preoccupied with information modelling, performance modelling and energy modelling; less has been done to enhance new developments of PMIMS in the project management guild. The companies were concerned more with activities that provided a direct benefit to them through effective coordination of its activities, improving performance and ultimately overall profitability. Concerns for the environment were less considered, possibly because there is less direct benefit from such consideration by the business.

The decision to embrace the recommendation for adoption of the PMIMS system was influenced to a greater extent by the type of business under consideration. Private limited companies were more willing to embrace information modelling, performance modelling and energy modelling. Regarding environment modelling, all the types of businesses were lacking in this aspect, with a few private limited companies indicating their consideration for the environment.

The study however identified some possible challenges in the adoption of PMIMS system that caters for all the aspects of PMIMS systems including information modelling, performance modelling, energy modelling and environment modelling. This implies that the organisations were cost conscious, with their significant investment decisions being greatly influenced by the cost implications associated with the decision. The higher the costs, then the less likely the construction businesses are to pursue an endeavor.

The study established that there would be more adoption of the full tenets of a PMIMS system, and it can be concluded that the possible pursuit of a PMIMS system is dependent on the possibility of direct benefits to the organisation. The research her also discovered that, private limited companies were at the forefront in consideration for a possible PMIMS system compared to other types of businesses, hence this type of business would be more likely to be operated within the confines of modern technology. This is likely because of their huge capital base which they can invest in the development of appropriate PMIMS system and which they believe will earn a reasonable return.

6.2.2 Conclusions on of improving project outcomes through PMIMS.

The study objectives sought to determine how the value of IM systems is currently viewed in the project management sector within the context of building and construction projects in

Australia. The study established that PMIMS adoption would improve the projects performance, energy, and environment. The results also suggested a migration by the construction businesses, from the previous manual systems and Microsoft supported applications like excel that tended to be cumbersome and tedious to utilise in a modern-day information system. Such a modern-day environment has seen a greater influence of stakeholders who require timely information. As such, construction firms have sought, and are seeking a possible PMIMS solution which is customisable whilst not compromising on prospects of delivering projects in time with an expected quality within expected cost.

While these systems reflect a step towards a modern PMIMS system in a modern day, they are not a panacea to information management in the construction sector. Significant challenges have been levelled against these systems for their failure to fully cater a solution to information management from initiation to completion of the project. Some systems were found to lack user friendliness, because of their complexity. They also failed to support all the information requirements for the entire project; hence another system must be factored in to provide for the current system's shortcomings.

It was also learnt that ability to develop an effective PMIMS system that is capable of addressing information needs from project initiation to completion, without the need to transfer information to other systems, or convert information to other forms, may help to reduce information insecurity and information loss. The result is likely to be an improvement in information management and ultimately an improvement in project outcomes.

6.2.3 Conclusions on the possible recommendation for a PMIM system

The objectives of this research sought determine if a project management IM system (PMIM) can be recommended to provide better project outcomes within the context of building and construction projects in Australia. Such a system is proposed would have a project life cycle that have stages that start from initiation, planning, project definition, documentation as well as delivery until disposal, which will benefit the project management fraternity.

Although information systems and software has been developed as part of efforts to improve construction project planning, tracking, report generation and updating with recent information these might not have been so helpful according to interviewees.

While cost savings are the major aim of modern information systems and technology along with huge corporate investments, flexibility allows the same systems to be for projects of different sizes to attain further cost savings. Additionally, cost savings were also predicted along with the need for flexibility within the formation of a PMIMS system.

It is interesting to note that from the literature review, Ali (2017) says that most project managers are faced with a myriad of problems when delivering projects in such environment leading to loses on projects and continuous low-key performance indicators (KPIs).

If a PMIMS is adopted as recommended, there are great chances of improving project outcomes, especially time, cost, and quality. Additionally, there can be a possible chance of timely and accurate information, feedback, and updates through effective stakeholder engagement.

Furthermore, the twine ball showed the words that were commonly spoken during the focus group discussion and how they are intertwined together which showed that there are words that were linked together as feedback from the interviewees. Some of the words include, *attributes, better, change, date, disposal, feel, finish, good, improvement, initiation, life, need, order, project, quality, recommendation, terms, time, view, change, channel, communication, delivery, expect, extend, give, group, indication, information, order, people, person, production, program, project, proposal, report, saying, speak, stake, start and time.*

Literature research suggests that drivers behind the adoption of new technologies include improvement of visualisations are constructability and which in turn leads to enhanced productivity and conflict detection (Newton & Chileshe 2017.

Also, according to Palos (2012), most Australian construction firms are failing to maximize their potential due to slow economic growth, high competition, and this has led to a strong continuous pressure on them leading to low productivity and performance in the industries.

The study found that participants valued a few things like effective communication as a crucial attribute of an ideal a PMIMS system, provision of complete information is crucial as the stakeholder will have no need to always seek clarification; rather a decision can be made based on the information provided. This information must be provided well in proportion at the correct time to enable relevant decisions to be made. Flexibility helps to avoid development or procurement of several systems for the same purpose. The need for a user-friendly system was also highlighted. The participants proposed a system that users can easily understand, though

not compromising on its functionality and usefulness. This is in line with the need for a system that can execute all functionality for information management on its own without the need to integrate with other systems.

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6.3 Comparison of initial interview to focus group discussion.

Table 20: Comparison of initial interview to focus group discussion.

Initial research Interviews questions	**Focus group discussions questions**	**Research consensus from focus group**
Main research question: "*Can project managers better utilise information modelling systems to achieve better project outcomes across the complete life cycle of building and construction projects in Australia"?* **Sub-research questions:** 1. What IM systems are currently used in the project management	1. What is your view regarding that interviews results that there less utilisation of IM systems amongst the construction firms in the project management fraternity? 2. What is your view regarding the proposal to embrace the recommendation for adoption of a PMIM system? 3. What is your view regarding that interviews results which established that PMIM system adoption would improve the projects execution, in terms of time, cost and quality? 4. What is your view regarding the interview's outcome that a proposed PMIM would extend a project life cycle that have stages that start from initiation, planning,	1. If a PMIMS is adopted as recommended, there are great chances of improving project outcomes, especially time, cost, and quality. 2. If a PMIMS is adopted as recommended, there can be a possible chance of timely and accurate information, feedback, and updates through effective stakeholder engagement. 3. Private limited companies were more willing to embrace information modelling, performance modelling and energy modelling. 4. It was also established from the project managers that there would be more adoption of

sector within the context of building and construction projects in Australia? 2. What are the issues for consideration in the design, development, and adoption of a possible PMIMS for the Australian building and construction sector? 3. What are the benefits of having functional PMIMs?	project definition, documentation as well as delivery until disposal? 5. Being cognisant of that, the researcher had an interest in the words or synonyms of the words that make up the question. The words and phrases like, better/improve information modelling system, time, cost, and quality.	the full tenets of a PMIMS system, and it can be concluded that the possible pursuit of a PMIMS system is dependent on the possibility of direct benefits to the organization. 5. Some project managers identified some possible challenges in the adoption of PMIMS system that caters for all the aspects of PMIMS systems including information modelling, performance modelling, energy modelling and environment modelling

6.4 Recommendations

It is recommended to formulate and adopt a comprehensive project management information system (PMIMS) to provide better project outcomes within the context of building and construction projects in Australia. It is also recommended that such a PMIMS should be capable of capturing the entire project life cycle commencing with the project's initiation, planning, project definition, and documentation, execution as well as delivery until disposal.

6.4.1 Recommendations for project managers

- Project managers of construction business organizations are recommended to play an active role in PMIM systems formulation and adoption to provide better project outcomes within the context of building and construction projects in Australia.

6.4.2 For the Australian Government

- To encourage policy frameworks in the project management fraternity that enhance development of PMIM system to enhance the effectiveness of PMIMS application in construction projects.
- Ensure monitoring mechanisms to enhance adherence to this proposal and procedures regarding the utilisation of modern technology in the information management within the construction industry.
- Provide incentives to encourage creativity and innovation amongst businesses on the development and utilisation of PMIM systems.

6.4.3 For future researchers

- The study focused on the investigation of situation of PMIM in Australia within the construction industry in Australia. Future studies may consider a comparative analysis of the Australian scenario to that of another country in a similar setting.

7 References

- Abanda, FH & Byers, L 2016, '*An investigation of the impact of building orientation on energy consumption in a domestic building using emerging BIM (Building Information Modelling)*', *Energy*, vol. 97, pp. 517-27.
- Adams 2018, TB *Journal of Bodywork and Movement Therapies*, - Elsevier
- Anderson, A, Marsters, A, Dossick, CS & Neff, G 2017, *'Construction to operations exchange: Challenges of implementing COBie and BIM in a large owner organization', in Construction Research Congress 2012:* Construction Challenges in a Flat World, pp. 688-97.
- Antwi-Afari, MF, Li, H, Pärn, EA & Edwards, DJ 2018, '*Critical success factors for implementing building information modelling (BIM):* A longitudinal review', Automation in Construction, vol. 91, pp. 100-10.
- Aranda-Mena, G, Crawford, J, Chevez, A & Froese, T 2019, *'Building information modelling demystified: does it make business sense to adopt BIM?',* International Journal of managing projects in business, vol. 2, no. 3, pp. 419-34.
- Arayici, Y, Coates, P, Koskela, L, Kagioglou, M, Usher, C & O'reilly, K 2017, *'BIM adoption and implementation for architectural practices',* Structural survey, vol. 29, no. 1, pp. 7-25.
- Azhar, S 2017, *'Building information modeling (BIM): Trends, benefits, risks, and challenges for the AEC industry',* Leadership and management in engineering, vol. 11, no. 3, pp. 241-52.
- Azhar, S, Khalfan, M & Maqsood, T 2015, '*Building information modelling (BIM): now and beyond', Construction Economics and Building*, vol. 12, no. 4, pp. 15-28.
- *Conference on Construction in Developing Countries*, pp. 435-46.
- Barati, R, Charehzehi, A & Preece, CN 2018, *'Enhancing planning and scheduling program by using benefits of BIM-based applications*', Civil and Environmental Research, vol. 3, no. 5, pp. 41-8.
- Baccarini, D. 2019, " *The Logical Framework Method for Defining Project Success"*, Project Manage Journal, *v*ol. 30, no. 4, pp. 25-32.
- Bartholomay, DJ 2018, *'Making Room for Methods: Incorporating Full-scale Research Projects in Non-methods Courses', Teaching Sociology*, vol. 46, no. 3, pp. 247-61.

- Becerik-Gerber, B & Rice, S 2018, *'The perceived value of building information modeling in the US building industry'*, Journal of Information Technology in Construction (ITcon), vol. 15, no. 15, pp. 185-201.
- Bernie Roseke, 2016, *Guide to the Project Life Cycle*
- Burgeronman, MM 2008, *Advances in mixed methods research:* Theories and applications, Sage.
- Burgeroneron, F. 2016, " *Factors influencing the use of DP chargeback information*.", MIS Quart, vol. 10, no. 3, pp. 225-238.
- Burgeroneron, F., Raymond, L., Rivard, S. & Gara, M.F. 2015, " *Determinants of EIS use: testing a behavioral model*.", Decision Support System, vol. 14, no. 1, pp. 131-146.
- Bobbert, Y 2017, 'On Exploring Research Methods for Business Information Security Alignment and Artefact Engineering', *International Journal on IT/Business Alignment and Governance (IJITBAG)*, vol. 8, no. 2, pp. 28-41.
- Bruno, S, De Fino, M & Fatiguso, F 2018, *'Historic Building Information Modelling: performance assessment for diagnosis-aided information modelling and management*', Automation in Construction, vol. 86, pp. 256-76.
- Cameron, R 2019, '*A sequential mixed model research design: Design, analytical and display issues*', International Journal of Multiple Research Approaches, vol. 3, no. 2, pp. 140-52.
- Cameron, R & MolinaAzorin, JF 2017, *'The acceptance of mixed methods in business and management research*', International Journal of Organizational Analysis, vol. 19, no. 3, pp. 256-71.
- Campbell, D & Cowton, CJ 2015, *'Method issues in business ethics research: finding credible answers to questions that matter'*, Business Ethics: A European Review, vol. 24, no. Supplement 1, pp. S3-S10.
- Chen, Y & Kamara, JM 2017, *'A framework for using mobile computing for information management on construction sites*', Automation in Construction, vol. 20, no. 7, pp. 776-88.
- Chong, H-Y, Lee, C-Y & Wang, X 2017, '*A mixed review of the adoption of Building Information Modelling (BIM) for sustainability*', Journal of cleaner production, vol. 142, pp. 4114-26.

- Dainty, A, Leiringer, R, Fernie, S & Harty, C 2017, *'BIM and the small construction firm: a critical perspective'*, Building Research & Information, vol. 45, no. 6, pp. 696-709.
- De Laat, R & Van Berlo, L 2017, *'Integration of BIM and GIS: The development of the CityGML GeoBIM extension', in Advances in 3D geo-information sciences*, Springer, pp. 211-25.
- Delen, D & Zolbanin, HM 2018, *'The analytics paradigm in business research*', Journal of Business Research, vol. 90, no. 1, pp. 186-95.
- DeVore, R, Petrova, G & Wojtaszczyk, P 2017, *'Data assimilation and sampling in Banach spaces'*, Calcolo, vol. 54, no. 3, pp. 963-1007.
- Eastman, C, Jeong, Y-S, Sacks, R & Kaner, I 2019, '*Exchange model and exchange object concepts for implementation of national BIM standards'*, Journal of Computing in Civil Engineering, vol. 24, no. 1, pp. 25-34.
- Aranda-Mena, G 2017, *'Building information modelling for facility management: are we there yet*?', Engineering Construction & Architectural Management (09699988), vol. 24, no. 6, pp. 1119-54.
- Ehrbar, H 2016, *'Building Information Modelling - A new tool for the successful implementation of major projects of German railways /* Building Information Modelling - Ein neues Werkzeug zur erfolgreichen Realisierung von Großprojekten der Deutschen Bahn', Geomechanik und Tunnelbau, vol. 9, no. 6, pp. 659-73.
- Elyamany, AH 2016, '*Current Practices of Building Information Modelling in Egypt'*, International Journal of Engineering Management and Economics, vol. 6, no. 1, pp. 59-71.
- Enegbuma, WI, Aliagha, GU, Ali, KN & Badiru, YY 2016, *'Confirmatory Strategic Information Technology Implementation for Building Information Modelling Adoption Model'*, Journal of Construction in Developing Countries, vol. 21, no. 2, p. 113.
- Enshassi, A, AbuHamra, L & Mohamed, S 2016, *'BARRIERS TO IMPLEMENTATION OF BUILDING INFORMATION MODELLING (BIM) IN THE PALESTINIAN CONSTRUCTION INDUSTRY'*, International Journal of Construction Project Management, vol. 8, no. 2, pp. 103-23.
- Fischer, M & Kunz, J 2014, *'The scope and role of information technology in construction', in Proceedings-Japan Society of Civil Engineers*, DOTOKU GAKKAI, pp. 1-32.

- Flower, A, McKenna, JW & Upreti, G 2016, '*Validity and Reliability of GraphClick and DataThief III for Data Extraction'*, Behavior Modification, vol. 40, no. 3, pp. 396-413.
- Gerbov, A, Singh, V & Herva, M 2018, *'Challenges in applying design research studies to assess benefits of BIM in infrastructure projects'*, Engineering Construction & Architectural Management (09699988), vol. 25, no. 1, pp. 2-20.
- Ghaffarianhoseini, A, Tookey, J, Ghaffarianhoseini, A, Naismith, N, Azhar, S, Efimova, O & Raahemifar, K 2017, *'Building Information Modelling (BIM) uptake: Clear benefits, understanding its implementation, risks and challenges*', Renewable and Sustainable Energy Reviews, vol. 75, pp. 1046-53.
- Govan, I & Berisha, B 2017, *BIM Building Information Model:* Hinder & Drivkraft.
- Hargrave F, 2009 - *Transgressivity, as an at- tempt to do homage to non-existence, is therefore fed by the complexity of ethics,* South African Journal of Philosophy, 2012

- Harrison, RL 2018, *'Using mixed methods designs in the Journal of Business Research, 1990–2010*', Journal of Business Research, vol. 66, no. 11, pp. 2153-62.
- Henry Stewart 2013 *The Business & Management Collection Talks Ltd*., London.
- Hoezen, M, Reymen, I & Dewulf, GP 2016, '*The problem of communication in construction', in International Conference on Adaptable Building Structures, ADAPTABLES 2006,* Eindhoven University of Technology.
- Hosseini, MR, Chileshe, N, Zuo, J & Baroudi, B 2015, '*Adopting global virtual engineering teams in AEC Projects: A qualitative meta-analysis of innovation diffusion studies'*, Construction Innovation, vol. 15, no. 2, pp. 151-79.
- Hudson G 2017 *A Simple building modelling procedure for MATLAB/SIMULINK, Proceedings of the 6th International Conference on Building Performance Simulation (IBPSA´99),* September, Kyoto-Japan, pp. 777-783
- Hurley, AE, Scandura, TA, Schriesheim, CA, Brannick, MT, Seers, A, VandenBurgeron, RJ & Williams, LJ 2017, *'Exploratory and confirmatory factor analysis: guidelines, issues, and alternatives'*, Journal of Organizational Behavior, vol. 18, no. 6, pp. 667-83.
- Hurmerinta-Peltomäki, L & Nummela, N 2016, *'Mixed methods in international business research: A value-added perspective'*, Management International Review, vol. 46, no. 4, pp. 439-59.

- Jamali, AA 2016 JEV Johnson *Demographic characteristics of socially responsible investors (SRIs) are likely to play a significant role in shaping their perceptions* - British Journal of 2016 - Wiley Online Library
- Jansson 2016, *Bridging the Three Gaps in Project Management. Writing on Project Management 2.0 blog at Wrike* (March 25, 2016),
- Jin, J 2013, '*Computer 3D Visualization Technology: A Dynamic Design Representation Tool in Solving Design and Communication Problems in the Early Phases of the Architectural Design Process'*, Mississippi State University.
- Jones JI 2019 - *Elsevier the possible effects of changing climate on a southern and a north-eastern English river.* Environment, 2019
- Jrade, A & Jalaei, F 2018, *'Integrating building information modelling with sustainability to design building projects at the conceptual stage', in Building Simulation,* Springer, pp. 429-44.
- Kelly, G, Serginson, M, Lockley, S, Dawood, N & Kassem, M 2018, '*BIM for facility management: a review and a case study investigating the value and challenges',* in Proceedings of the 13th International Conference on Construction Applications of Virtual Reality, pp. 30-1.
- Kiprotich, CJK 2014, '*An investigation on Building Information Modelling in Project Management: challenges, strategy and prospects in the Gauteng Construction Industry*, South Africa'.
- Kisely, S & Kendall, E 2017, *'Critically Appraising Qualitative Research: a Guide for Clinicians More Familiar With Quantitative Techniques',* Australasian Psychiatry, vol. 19, no. 4, pp. 364-7.
- *Krivokapic-Skoko, B & O'neill, G 2017, 'Beyond the qualitative–quantitative distinction: Some innovative methods for business and management research'*, International Journal of Multiple Research Approaches, vol. 5, no. 3, pp. 290-300.
- Lee, J-Kdhak, Eastman, Ccecge & Lee, Yzgc 2015, *'Implementation of a BIM Domain-specific Language for the Building Environment Rule and Analysis'*, Journal of Intelligent & Robotic Systems, vol. 79, no. 3/4, pp. 507-22.
- Leung, BH 2017, *'Building Information Modeling (BIM): A new paradigm for visual interactive modeling and simulation for construction projects',* in *Proc.,* First Internationa*l*

- Liang, C, Chang, C-C & Hsu, Y 2014, *Imaginative Capability Scale*, <http://ezproxy.usq.edu.au/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=pst&AN=9999-40603-000&site=ehost-live
- Liao, L & Teo, EAL 2017, '*Critical Success Factors for enhancing the Building Information Modelling implementation in building projects in Singapore'*, Journal of Civil Engineering & Management, vol. 23, no. 8, pp. 1029-44.
- Linderoth, HC & Jacobsson, M 2018, *'Understanding adoption and use of ICT in construction projects through the lens of context, actors and technology'*, in Proceeding of CIB W, pp. 203-12.
- Linderoth, HCJ 2018, *'Understanding adoption and use of BIM as the creation of actor networks'*, Automation in Construction, vol. 19, no. 1, pp. 66-72.
- Loehnert, G, and Voss, K. *Energy efficiency in commercial buildings - experiences and results from the German funding program SolarBau.* Germany: N. p., 2004. Web.
- Lohmeyer 2017 GT Sewage and Industrial Wastes, *The identify ing characteristic of the **Accelo**-Filter is that the filter effluent is returned di rectly to a headbox where it mixes with the settled influent*
- Love, PE, Sing, C-P, Wang, X, Irani, Z & Thwala, DW 2014, *'Overruns in transportation infrastructure projects'*, Structure and Infrastructure Engineering, vol. 10, no. 2, pp. 141-59.
- Lovekamp, WE, Soboroff, SD & Gillespie, MD 2017, *'Engaging Students in Survey Research Projects across Research Methods and Statistics Courses'*, Teaching Sociology, vol. 45, no. 1, pp. 65-72.
- Mantel A- *Elsevier Information systems project management: an agency theory interpretation* Journal of Systems and Software, 2014
- Mauceri, S 2016, *'Integrating quality into quantity: survey research in the era of mixed methods'*, Quality and Quantity, vol. 50, no. 3, pp. 1213-31.
- McAloney, K 2019, '*Review of Social research methods (3rd ed)'*, Psychology Teaching Review, vol. 15, no. 1, pp. 90-1.
- McCarthy, L & Muthuri, JN 2018, *'Engaging Fringe Stakeholders in Business and Society Research:* Applying Visual Participatory Research Methods', Business & Society, vol. 57, no. 1, pp. 131-73.

- Miettinen, R, Kerosuo, H, Metsälä, T & Paavola, S 2018, '*Bridging the life cycle: a case study on facility management infrastructures and uses of BIM'*, Journal of Facilities Management, vol. 16, no. 1, pp. 2-16.
- Migilinskas, D, Popov, V, Juocevicius, V & Ustinovichius, L 2013, *'The benefits, obstacles and problems of practical BIM implementation'*, Procedia Engineering, vol. 57, pp. 767-74.
- Mihindu, S & Arayici, Y 2018, *'Digital construction through BIM systems will drive the re-engineering of construction business practices*', *in Visualisation*, 2008 International Conference, IEEE, pp. 29-34.
- Morgan, D. & Krueger, R. (1993). When to use focus groups and why. In Morgan, D. L. *SAGE Focus Editions: Successful focus groups: Advancing the state of the art*
- Monozam, NH, Monazam, HH, Hosseini, MR & Zaeri, F 2016, *'Barriers to adopting building information modelling (bim) within south australian small and medium sized enterprises'*, Project Management Development - Practice & Perspectives, pp. 125-32.
- Newton, K & Chileshe, N 2016, '*Awareness, usage and benefits of building information modelling (BIM) adoption*-The case of the South Australian construction organisations'.
- Neuman D, 2016 *Systems model-based research: an integrative review project*', Nursing Science Quarterly, vol. 14, no. 3, pp. 231-8.
- Olokundun, M, ibidunni, S, Ogbari, M, Peter, F, Borishade, T, Falola, H, Salau, O & Kehinde, O 2018, '*Survey data on teaching strategies and product innovation: A focus on selected university students in Nigeria'*, Data in Brief, vol. 18, no. 1, pp. 248-54.
- Palos, S 2016, *'State-of-the-art analysis of product data definitions usage in BIM'*, eWork and eBusiness in Architecture, Engineering and Construction: ECPPM 2012, p. 397.
- Park, JH & Lee, G 2017, *'Design coordination strategies in a 2D and BIM mixed-project environment: social dynamics and productivity'*, Building Research & Information, vol. 45, no. 6, pp. 631-48.
- Park, K 2006, *'Book review: Handbook of qualitative research methods for international business'*, Journal of International Management, vol. 12, no. 3, pp. 379-82.
- Peansupap, V & Walker, D 2015, *'Exploratory factors influencing information and communication technology diffusion and adoption within Australian construction*

organizations: a micro analysis', Construction Innovation (Sage Publications, Ltd.), vol. 5, no. 3, pp. 135-57.

- Perren, L & Ram, M 2014, '*Case-Study Method in Small Business and Entrepreneurial Research: Mapping Boundaries and Perspectives'*, International Small Business Journal, vol. 22, no. 1, pp. 83-101.
- Peseta, T, Hicks, M, Holmes, T, Manathunga, C, Sutherland, K & Wilcox, S 2015, *'The challenging academic development (CAD) collective',* International Journal for Academic Development, vol. 10, no. 1, pp. 59-61.
- Poirier, EA, Staub-French, S & Forgues, D 2015, *'Measuring the impact of BIM on labor productivity in a small specialty contracting enterprise through action-research',* Automation in Construction, vol. 58, pp. 74-84.
- Project Management Institute. 2013. *A guide to the project management body of knowledge (PMBOK guide)*
- Puig, N 2019, *'Research methods for business students. 2nd ed. (Review)',* European Sport Management Quarterly, vol. 1, no. 4, pp. 323-5.
- Rahmani, M & Atia, GK 2017, '*Spatial Random Sampling: A Structure-Preserving Data Sketching Tool',* IEEE Signal Processing Letters, vol. 24, no. 9, pp. 1398-402.
- Raymond, L. & Burgeroneron, F. 2014, *"Project Management Information Systems: An empirical study of their impact on project managers and project success",* International Journal of Project Management, vol. 6, no. 2.
- Reinecke, J, Arnold, DG & Palazzo, G 2016, *'Qualitative Methods in Business Ethics, Corporate Responsibility, and Sustainability Research',* Business Ethics Quarterly, vol. 26, no. 4, pp. xiii-xxii.
- Robichaud LB and Anantatmula, VS 2017, *'Greening Project Management Practices for Sustainable Construction*', Journal of Management in Engineering
- Robson, C & McCartan, K 2016, *Real world research*, John Wiley & Sons.
- Roger N 2019 *'Adoption of building information modelling technology (BIM) perspectives from Malaysian engineering consulting services firms'*, Engineering, Construction and Architectural Management, vol. 22, no. 4, pp. 424-45.
- Rogers, J, Chong, H-Y & Preece, C 2015b, *'Adoption of Building Information Modelling technology (BIM)',* Engineering Construction & Architectural Management (09699988), vol. 22, no. 4, pp. 424-45.

- Ruel, S 2017, *'Qualitative Methods in Business Research', Qualitative Research in Organizations and Management:* An International Journal, vol. 12, no. 1, pp. 87-8.
- Sabol, L 2018, *'Building information modeling & facility management'*, IFMA World workplace, pp. 2-13.
- Sacks, R, Koskela, L, Dave, BA & Owen, R 2018, *'Interaction of lean and building information modeling in construction'*, Journal of construction engineering and management, vol. 136, no. 9, pp. 968-80.
- Santos, JRA 2019, *'Cronbach's alpha: A tool for assessing the reliability of scales*', Journal of extension, vol. 37, no. 2, pp. 1-5.
- Scherer, LD, de Vries, M, Zikmund-Fisher, BJ, Witteman, HO & Fagerlin, A 2015, *Decision Measures*,
- Sekaran, U & Bougie, R 2018, *Research methods for business students*, USA, Wiley.
- Shankar, PR, Davenport, MS, Woolen, SA, Carlos, RC & Maturen, KE 2018, *'Survey Research'*, Academic Radiology, vol. 25, no. 6, pp. 751-6.
- Singer, BR, McLauchlan, GJ, Robinson, M & Christie, J 2018, *'Epidemiology of fractures in 15,000 adults: the influence of age and gender'*, Journal of Bone and Joint Surgery - British Volume, vol. 80, no. 2, pp. 243-8.
- Smith, P 2015, *'The Reliability and Validity of One-zero Sampling: misconceived criticisms and unacknowledged assumptions'*, British Educational Research Journal, vol. 11, no. 3, pp. 215-20.
- Srivansan, B 2013, 'Project Management Process Groups & Processes (PMBOK® 5th Edition)', *Project Management & Leadership Champions*, Wordpress, viewed 14 September 2020, <https://leadershipchamps.wordpress.com/tag/project-management-process-groups>.
- Steward RA,2013 Mohamed S, Daet R. *Strategic implementation of IT/IS projects in construction: a case study*. Automat Constr 2015;11:681–94.
- Sifri, G. 2017, *"When to consider a project management information system"*, *Tech Republic*, [Online], vol. 1, no. 1, pp. 15/03/2017. Available from: www.techrepublic.com/blog/tech-manager/when-to-consider-a-project-management-information-system/609. [4/12/2018].
- Tan, P, Zeng, G, Wang, J, Wei, SB & Quan, L 2017, 'Image-based tree modeling', in ACM Transactions on Graphics (TOG), ACM, p. 87.

- Telerman V 2017 *A recent project management tool named from LiquidPlanner* 20 Google Patents,

- Turner, J.R. 2019, *The Handbook of Project Based Management*, 2nd edn, McGraw-Hill, Maidenhead Berkshire.
- Utica, Ggupi, Pinti, Llppi, Guzzoni, Llgpi, Bonelli, Ssbmpi & Brizzolari, Aabmpi 2017, *'Integrating laser scanner and bim for conservation and reuse: "the lyric theatre of milan"'*, ISPRS Annals of Photogrammetry, Remote Sensing & Spatial Information Sciences, vol. 4, no. 5/W1, pp. 77-82.
- Vass, S & Gustavsson, TK 2017, *'Challenges when implementing BIM for industry change'*, Construction Management & Economics, vol. 35, no. 10, pp. 597-610.
- Wahyuni, D 2017, '*The research design maze:* Understanding paradigms, cases, methods and methodologies'.
- *Wang, G & Song, J 2017, 'The relation of perceived benefits and organizational supports to user satisfaction with building information model (BIM*)', Computers in Human Behavior, vol. 68, pp. 493-500.
- Waysman, M & Savaya, R 2017, *'Mixed Method Evaluation: A Case Study'*, American Journal of Evaluation, vol. 18, no. 1, pp. 227-37.
- Wei, C 2018 *Environmental information on energy consumption, propose a design framework based on integrated* ***management*** *of* ***building*** *...* **Building** Electricty;2018,p.25-28
- Wen, W & Rui, H 2018, *'A review of Building Information Modelling'*, AIP Conference Proceedings, vol. 2017, no. 1, pp. 1-4.
- Winterton, J 2018a, *'Review: Business Research Methods ALAN BRYMAN and EMMA BELL. Oxford*: Oxford University Press, 2017. xxxii + 786 pp. £34.99 (pbk). ISBN 9780199284986', Management Learning, vol. 39, no. 5, pp. 628-32.
- Winterton, J 2018b, '*Business Research Methods'*, Management Learning, vol. 39, no. 5, pp. 628-32.
- Wong, K-d & Fan, Q 2013, '*Building information modelling (BIM) for sustainable building design'*, Facilities, vol. 31, no. 3/4, pp. 138-57.

- Wu, I-C & Hsieh, S-H 2017, *'A framework for facilitating multi-dimensional information integration, management and visualization in engineering projects'*, Automation in Construction, vol. 23, pp. 71-86.
- Zelnick, LR, Schildcrout, JS & Heagerty, PJ 2018, *'Likelihood-based analysis of outcome-dependent sampling designs with longitudinal data',* Statistics in Medicine, vol. 37, no. 13, pp. 2120-33.

8 Appendices

8.1 Interview questions guide for key informants.

1. To what extent would you say project managers are currently using IM systems in building and construction projects within Australia?

- If you are using them, for how long have you been using them?
- How do these collaborate with other project stakeholders?

2. How useful are these IM systems, if at all, in your everyday project delivery?

3. What shortfalls, including the barriers to the adoption and implementation of a PMIMS system,

4. Can a project management system (PMIMS) be developed to provide better project outcomes in the context of building and construction projects in Australia?

5. What attributes would you consider relevant for a PMIMS system for building and construction projects in Australia?

- What elements would you want in such a PMIMS?
- Would such elements improve project delivery in terms of time, cost, and quality?
- Would such elements improve project delivery in terms of communication between the stakeholders?

6. What would a PMIMS system framework structure for such projects look like in terms of:

- Background
- Contents

7. How do you foresee the future of PMIMS in the Australian building and construction sector?

8.2 Interviewee's common themes

Interviewee 1	**Common Themes**	**key words**
1. What IM systems are currently used in the project management sector within the context of building and construction projects in Australia? 2. What are the issues for consideration in the design, development, and adoption of a possible PMIMS for the Australian building and construction sector? 3. What are the benefits of having functional PMIMs?	*-Accelo works in alliance with Building Information Modelling Systems (BIM) however, there are things that Accelo cannot do that BIM can do.* *-Well, they are very useful because you essentially cannot run a project without an information modelling system; you cannot do much without one information modelling system.* *- Well like I said before if there were an information modelling system that would cater from initiation until the end of the project life cycle that would really help.* *-Yes, these elements would improve the project delivery in terms of time, cost, and quality because every project is anchored on f time, cost and qualityso these are the things that would be making sure should be achieved*	*-Building Information Modelling Systems (BIM)* *- cater from initiation until the end.* *- improve the project delivery* *- time cost and quality*
Interviewee 2	**Common Themes**	**key words**
1. What IM systems are currently used in the project management within the context of building and construction projects in Australia? 2. What are the issues for consideration in the design, development, and	*-Although IPQ is not as good as other IMs, I can say this is one of the information modelling systems that is used in project management in building and construction projects all around Australia. A long time ago we used to use just Excel; it was useful, but we did not need to use it in most of the projects since it was limited.* *- I will give you an example: if you want to make a project life cycle from the beginning to the end it is difficult.*	*- used to use just Excel.* *- very handy for planning* *- by improving on our time and cost* *- to track your time and costing of the project*

adoption of a possible PMIMS for the Australian building and construction sector? 3. What are the benefits of having functional PMIMs?	*- so, the major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is done promptly making sure visual aids that are included.* *- Correspondingly, by improving on our time and cost we would now be using less time to transfer from one program to another and that would help us especially if you want to track your time and costing of the project, and even the quality.*	
Interviewee 3	**Common Themes**	**key words**
1. What IM systems are currently used in the project management sector within the context of building and construction projects in Australia? 2. What are the issues for consideration in the design, development, and adoption of a possible PMIMS for the Australian building and construction sector? 3. What are the benefits of having functional PMIMs?	*This is a solution given for Project Management resource planning and things like even final finance management. It also deals with things like time planning, Cost planning.* *- Maven link is a software for project management solutions, resource planning and things like that but the expediency of it every moment is a bit tricky even though it is you undertaking the job.* *- I think another project management information system is availed, maybe you can be able to come up with something.*	*- It also deals with things like time planning* *- resource planning* *- project management solutions*
Interviewee 4	**Common Themes**	**key words**
1. What IM systems are currently used in the project management within the context of building and construction projects in Australia?	*-Project management is ready for a revolution; traditional project planning Solutions rely on people to manually adjust schedules that precedence. Liquid planner is predictive project management software for modern businesses that we use at our company but works in alliance with Building Information Modelling Systems (BIM).*	*- used to use just Excel.* *- by improving on our time and cost* *project*

2. What are the issues for consideration in the design, development, and adoption of a possible PMIMS for the Australian building and construction sector? 3. What are the benefits of having functional PMIMs?	*-Also, the major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is done punctually making sure visual aids are included making sure there is a flawless communication channel amid stake holders and the client.* *-Since the successful success of a project is moored to time management, management of the cost of project management and the overall management, better IMs solutions can improve those key elements of project management*	*-Building Information Modelling Systems (BIM)* *- cater from initiation until the end.* *- time cost and quality*
Interviewee 5	**Common Themes**	**key words**
1. What IM systems are currently used in the project management within the context of building and construction projects in Australia? 2. What are the issues for consideration in the design, development, and adoption of a possible PMIMS for the Australian building and construction sector? 3. What are the benefits of having functional PMIMs?	*- When you use it, you will be able to focus on work and be able to make data entry in any form in time.* *-However, there is something that I feel that can be done— it can be able to put everything together to have one optimal IMs in order to make projects comparatively faster and be able to plan all that you need, and to be able to do things in other software like in Excel.* *-As alluded to before, if there were a project management information modelling system that would cater from initiation until the end of the project life cycle that would really help us as project managers*	*- cater from initiation until the end.* *- improve the project delivery* *- time cost and quality* *- resource planning* *- project management solutions*

Interviewee 6	Common Themes	key words
1. What IM systems are currently used in the project management sector within the context of building and construction projects in Australia? 2. What are the issues for consideration in the design, development, and adoption of a possible PMIMS for the Australian building and construction sector? 3. What are the benefits of having functional PMIMs?	-. *I use Wrike software when the project team is working on a project and look for any requests that come out; your request to help at the new project opening. Do you have time to work on a new project? It is available for you always and anywhere offline.* *- Once there is an information management system that can take work from the beginning to the end, I think it will be an improvement* *- One of the key attributes that I want on an information modelling system like this one is probably things like our being able to start and finish the project.* *- Once there is an information management system that can take work from the beginning to the end, I think it will be an improvement.*	*-anywhere offline* *- Able to start and finish the project.* *- by improving on our time and cost* *- to track your time and costing of the project*
Interviewee 7	**Common Themes**	**key words**
1. What IM systems are currently used in the project management sector within the context of building and construction projects in Australia? 2. What are the issues for consideration in the design, development, and adoption of a possible PMIMS for the Australian building and construction sector?	*- The software that we use for project management and Information wanting system in our company is called Fresh desk. It is a cloud-based system and it normally works with the support of a technical team staff, and everything that you do is to check the project progress and manage it.* *-Purpose of collaboration with a stakeholder. I think I just explained that to you about the stakeholder and collaboration.* *- One of the key attributes that I want on an information modelling system like this one is probably things like our being able to start and finish the project.*	- to *check the project progress* *- collaboration with a stakeholder* *- communicate with other stakeholders.* *-by improving on our time and cost*

3. What are the benefits of having functional PMIMs?	*- And there should be an improvement in terms of our communication and delivery of projects.*	
Interviewee 8	**Common Themes**	**key words**
1. What IM systems are currently used in the project management sector within the context of building and construction projects in Australia? 2. What are the issues for consideration in the design, development, and adoption of a possible PMIMS for the Australian building and construction sector? 3. What are the benefits of having functional PMIMs?	*-ASANA is a IMs that we use at our company. To find our company's teams in projects, and teams like marketing design, and Human Resources Asana makes it very easy. Asana can be used to run a complete organization making it simple for all groups to way better collaborate among themselves and with each other. - Yes, one of the disadvantages of this information system is when it's down especially when it comes to payments and collaborating with other software and workspaces within the project.* *- Most of the time in project management where you lose money is why you cannot couple this three things, time, cost, and quality.* *- If anything, that has to do with the improvement in the project management information modelling fraternity, then that means that the cost in quality will be more enhanced.*	*- makes it very easy* *- collaborating with other software* *- workspaces within the project* *-- by improving on our time and cost*

8.2.1 Structured interview questions with summary responses

INTERVIEW 1. Question	**Answer/Response Summary**
What information modelling system is currently used in project management sectors in the context of building and construction projects in Australia?	*Well, there is more than one information modelling system which I use and one of them is called Accelo. With Accelo, we use it in our company and Accelo was custom- made for our company. Accelo works in alliance with Building Information Modelling Systems (BIM) however, there are things that Accelo cannot do that BIM can do. I can say this is one of the information modelling systems that is used in project management and this Accelo; we have used it habitually in building and construction projects all around Australia. This platform is automated and rationalizes work into one integrated system with Excel client accounts, project timesheets and projects are tracked for you so you can spend less time and meetings and dealing with admin work. Accelo provides answers to important questions instantly giving your insight so you can track as well as it helps to make decisions with confidence by streamlining your operations; you will be free to dedicate your full attention to your client. This technology platform that makes you and your team more productive, profitable, and confident. Long time ago, we used to use just Excel, it was useful, but we didn't need to use it in most of the projects since it was imperfect, and we only used it for small projects and construction and project management, as the company grew; that is when we thought of customising our own Accelo and moving away from Excel - and that's all I can say about one information modelling system.*

How useful are these information modelling systems, if any, in your everyday project delivery?	*Well, they are very useful because you essentially cannot run a project without an information modelling system; you cannot do much without one information modelling system. That's why for every project that we run we use at least one of the information modelling systems of some sort and if we don't do that, we would have project delays, paperwork accretion because we would not be using any one information modelling system therefore, they are very important and very useful. But like I said, this one information modelling system we use sometimes for other things and some for the other like this Accelo, we use it for planning. Accelo is very handy for planning, but when looking at information sharing or information transfer, we find out it is not very useful; that is when we change to BIM. That is what I can say for now; they are very useful but, in some way, they are not as useful as one would want it to be. Thank you*
How long have you used information modelling systems?	*Well, I can say we have been using these information modelling systems since 2013 and since that time we have not transformed, we have always been using these information modelling systems, the Accelo like I told you it has been handy from 2013-2018— it's about 5 years*
How do these information modelling systems collaborate with other stake holders?	*Well like I said, these information modelling systems are not very user-friendly; when we do collaboration with other project stake holders, we would use other software like BIM or other project management information systems. We would use something else because Accelo cannot do much collaboration with other stake holders, that is why we choose to use other information modelling systems to do collaboration and communicate with other stake holders.*

What shortfalls are you experiencing and what do you think will be the future problems with the current IMs	*Yes, like I told you before we are having problems with the information modelling systems we are using now in a way because we need to switch from one to the other and during that process, we are prone to lose some information, also another software might not fully interpret what you have told the other and this sometimes affects our management information modelling system from the start to the end of the project management of the project life cycle.*
What would be the key attributes and qualities of the proposed project management information modelling system for such projects? What would you want	*Well like I said before if there were a project management information modelling system that would cater from initiation until the end of the project life cycle that would really help. The major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is done promptly making sure there is a clear communication channel between stake holders and a way of doing things that simplify an information modelling system, not a complicated one, that is user friendly that anyone can use.*
What element would you want in such a PMIMS	*Well, the elements I told you before, exclusively the element of planning and to be able to interact with project stakeholders and to be able to communicate with other team members. Those major elements we would need in such a project management information modelling system.*

Would such elements improve project delivery in terms of time, cost, and quality	*Yes, these elements would improve the project delivery in terms of time, cost, and quality because every project is anchored on time cost and quality so these are the things that would be making sure should be achieved. Also, if this project management information modelling system that you are proposing, it would cut on our time and cost. This means that I would now be using less time to transfer from one program to another and that would help me especially if I want to track time for my costing of the project and even the quality of the project. Yes, these elements would improve on the delivery in terms of cost, time, and quality.*
Would such elements improve project delivery in terms of communications of stake holders	*I think I answered this one before; yes, these elements would definitely improve communication between stake holders because it automatically improves delivery time delivery in terms of communication, and delivery as a whole; that would definitely improve the delivery since communication is the key to the project—it would be good.*
What would a framework structure of a PIM (Project Management information modelling system) for such projects look like for their	*Well, I'm not sure what you mean in terms of background and contents, but I will try to answer it as much as I can; in terms of background, I think it would just be anything that has project information that has happened before like the history of the project; those are the minor things needed in the project. Since communication is the key, we needed to have interaction with other people in terms of sending emails ascribing information; things like probably something there and some things that are out of this world like the visual aids or something like that Thank you*

background contents	

INTERVIEW 2 Question	**Answer/Response summary**
What information modelling system currently used in project management sector in the context of building and construction projects in Australia?	*To be frank with you there are so many modelling systems that are currently used in project management, however we've got just a few that we use at our company so I'm going to just tell you about this one called IPQ. Although IPQ is not as good as other IMs, I can say this is one of the information modelling systems that is used in project management in building and construction projects all around Australia. A long time ago we used to use just Excel; it was useful, but we did not need to use it in most of the projects since it was limited. IPQ was started by a certain man called in Teko Tuna, one of the project management gurus. This man was from Iraq and he discovered that he could do better with an IPQ than the then IMs, so he started working with IPQ. IPQ was custom made for our company and this IPQ works in collaboration with Building Information Modelling Systems (BIM) however, there are things that IPQ cannot do that BIM can do. We also only used it on small projects and construction and project management as the company grew; that is when we thought of customising our own IPQ and moving away from Excel and that's all I can say about one information modelling system.*

How useful are these information modelling systems if any in your everyday project delivery?	*Without project management information modelling systems there is virtually nothing you can do in project management, that is why it is important to continue to use information modelling systems. Without that you can run any project and think you have succeeded but all that you need and want is information modelling systems. Without them surely you will fail, that is why, from our discussion just before the interview, is that we need something that can work on that can be done in order to come up with something that is reasonable, to be able to satisfy our needs in project management. This will surely help a lot in their delivery of project management in every sector and in every field of project management. Well, they are very useful because you actually cannot run a project without this one information modelling system; you cannot do much without one and that's why for every project that we run we include at least one of the information modelling systems of some sort; and if we don't do that, we would have project delays, and paperwork accumulation therefore they are very important and very useful. But like I said, this one information modelling system we use, sometimes for one thing and sometimes for other things, like this IPQ, we use it for planning— it is very handy for planning but when looking at information sharing, or information transfer we find out it is not very useful; that is when we change to BIM. That is what I can say for now. They are very useful but, in some way, they are not as useful as one would want them to be.*
How long have you used information modelling systems?	*Although information modelling systems have been in existence for a long time, I can say in our company we migrated from the use of Paper project management into information modelling systems some time back, in 2003 I think it was that we migrated from paper to information modelling systems. Well in the beginning we cannot really say it was a project management without that information. Modelling systems, we could do yes, we could use things like Excel, also we could use things like Word, but it was in the olden days— just a few people were able to use computers and yeah everybody else could be able to understand if people don't even have the plans were also in papers. Well, I can say we have been using these information modelling systems since 2013 and since that time we have not changed; we have*

	always been using these information modelling systems; the IPQ like I told you— it has been handy from 2013-2018, it's about 5 years
How do these information modelling systems collaborate with other stake holders?	*In terms of collaboration with other stakeholders this is where a new information Modelling system would probably come in because right now the communication is a bit tricky when it comes to communicating with other project stakeholders; for example, when we have a meeting. When you want to conduct a meeting, it is just a fight, it will be difficult to be able to talk to everybody at one go. You would probably need to send emails to each person which would be very cumbersome and would be very difficult especially when you are dealing with their project. I remember there was one project that we did— it was a $15 million project and that was way back in I think 2008/2009 around about, it was so difficult, very difficult to be able to communicate with other people and be able to communicate in terms of the communication. Well like I said, these information modelling systems are not very user friendly and when we do collaboration with other project stake holders, we would use other software like BIM or project management information systems; we would probably use something else because IPQ cannot do much in the way of collaboration with other stake holders; that is why we choose to use other information modelling systems to do collaboration and communicate with other stake holders*

What shortfalls are you experiencing and what do you think done will be the future problems with the current …	*Now I can see there are just a few shortfalls that you are facing but one of the biggest shortfalls is not being able to complete everything in one go. I'll give you an example: if you want to make a project life cycle from the beginning to the end it's difficult with this IMs: we will probably need something that is going to be helpful and which is going to be able to run from initiation until demolition, and be able to talk to other project managers and communicate with all the stakeholders; and be able to talk in a language that everyone else will understand, then probably that would help especially to be able to address future problems and come up with a solution. Also like I told you before we are having problems with the information modelling systems we are using now in a way, because we need to switch from this one to that one and during the way we might lose some information. Another software might not fully interpret what you have told the other software surely, we are having problems with that and we need for that to be ratified as soon as possible. I think someone should help us with that because all we need is a wholesome project management information modelling system that can help us from the start to the end of the project management of the project life cycle.*

What would be key attributes/qualities if the proposed project management information modelling system for such projects would you want	*There are people like PMBOk, which they tried by every means to put together what a project management would look like, in what characteristics of a project life cycle and other project phases of the project lifecycle management. Although it is not the best that people need now, it is something. I am trying to explain this the best I can about the actual IMs. With the management book (PMBOk) we see they have the qualities that they've tried to put together like the qualities of a good IMs, but they don't really give us what we need; they don't really put together all that is needed for an information modelling system especially when it comes to communication, especially when it comes to things like communicating with customers. But like I said before if there is there is a project management information modelling system that would cater from initiation until the end of the project life cycle that would really help us; so the major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is done promptly making sure visual aids that are included, making sure there is a clear communication channel between stake holders and the client and a way of doing things that simple an information modelling system, not a complicated one, that is user friendly that anyone can use.*
What element would you want a such a PMIMS	*Well I think this is just a replication of the last question but yeah the elements that we need maybe in the project management information systems that I just said about communication, like being able to collaborate with other stakeholders, yeah just a few things not much just if you're posting that's what you need to take much more easier to be able to work with; not much effort and yeah that would be good for us, also the element of planning from initiation to demolition, and to being able to interact with project stake holders and to be able to communicate with other team members.*

Would such elements improve project delivery in terms of time, cost, and quality	*Everybody knows that your project management is about time cost and quality. If those things are not met then there is no good project, then everybody else agonizes from the client and until the project manager. You'll find that sometimes you will be trying to manage a project well then you'll see some project being up and only having troubles and having some arguments at sites being attributed by the delays from the inefficient IMs, however if time, cost and quality are able to be harnessed from the beginning through the use of correct and efficient IMs, then that will be alright and that means we should be able to improve cost time and quality of project that we do. Correspondingly, by improving on our time and cost we would now be using less time to transfer from one program to another and that would help us especially if you want to track your time and costing of the project, and even the quality. Yes, these elements would improve on the delivery in terms of cost, time, and quality.*
Would such elements improve project delivery in terms of communications of stake holders	*Good elements will improve project delivery. Communication is the key for project management. If communication is not good during the project then everything else will go hey-wire that's why it is important to make sure that you have enough resources, you have good systems, and you have enough tools; you have enough of everything in IM and that will make your life easy especially in terms of communication. Oh, the project delivery, yeah, I think so.*
What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents	*Well, I am not sure what you mean in terms of background and contents, but I will try to answer it as much as I can in terms of background. I think it would just be anything that has project information that has happened before like the history of the project and other things needed in the project like communication, as it is the key. Thank you.*

INTERVIEW 3 Question	**Answer/Main points**
What information modelling system currently used in project management sector in the context of building and construction projects in Australia?	*In our company we use the software that is called Maven link software. This is a solution given for Project Management resource planning and things like even final finance management. It also deals with things like time planning, Cost planning. It is designed mostly to be used by businesses and to easily collaborate with the project managers and to use all the project management tools—yeah that is what we use at our company. It's good for export compatibility especially when it comes to things like scheduling and it works with programs like QuickBooks, you know when you are using QuickBooks it's easy to collaborate with project management but yeah that's what we can do you just have to use that yeah that's what the company can provide, then now you can't do anything when the company says use this year, even though I think there could be better things out there in the market.*
How useful are these information modelling systems if any in your everyday project delivery?	*Like I said before Maven link is a software for project management solutions, resource planning and things like that but the expediency of it every moment is a bit tricky even though it is you undertaking the job; it is the one that we're using on a day-to-day basis, that is cost management, time in planning, all the sort of things. To be analytic yeah it is that it just works on one project design per time, and in terms of navigation, it doesn't really have many tabs, I like navigation but just limited yeah so yeah, it's alright yeah alright, that's alright for now.*
How long have you used information modelling systems?	*In this company with this one, this information system I have been using it for about 2 years now and we have been talking to management review about this information modelling system. When you are you in the company you can't ask a lot, you can't request for a lot of changes yeah just be looking at you and well not knowing where you are coming from and what are you at, your question would come up with probably something much better.*

How do these information modelling systems collaborate with other stake holders?	*Well like I told you there are pros and cons in using this software and one of the things is the collaboration yet to be called to be able to collaborate between the customers and other stakeholders, people like people to be able to communicate but it's not easy. One of the things that I wanted to point out is that you would be able to collaborate with the sub-contractors and the other people that we deal with on a day-to-day basis but yeah, we've tried to talk to the support team since I bought this software but looks like we are not going anywhere.*
What shortfalls you are experiencing and what do you think done will be the future problems with the current.	*The major short falls that I see that you could face if we continue to use this software are that probably it will cost us is that of losing customers. When you lose customers that is one of the things that no one ever in this world would want, so yeah especially when it comes to delivery yeah that is where my heart beats when it comes to delivery. Without proper delivery of the project you are doomed, you cannot do anything, you may as well go back home.*
What would be key attributes qualities if the proposed project management information modelling system for such projects would you want	*From my previous answers, I still believe that if there is a project management information modelling system that would cater from initiation until the end of the project life cycle that is until the demolition stages, I would want in such a PMIMS Project management information modelling system, would be making sure the communication is done promptly, making sure there is a clear communication between stake holders and the client as well as a simple information modelling system, not a complicated one that is user friendly and that anyone can use.*

What element would you want a such a PMIMS	*It is mostly difficult to spell out what you are trying to out here, but I will try to answer in the best way that you think is right.*
Would such elements improve project delivery in terms of time, cost, and quality	*For your projects to be able to succeed you know you need to be able to apply all the knowledge skills, all the techniques and all the activities that are needed for the project requirement. Yes, looking at things, like the stakeholders who sometimes have different opinions and to be competing with ever-changing sites, together with the demands of the client, in project management the time, cost and quality would improve project delivery.*
Would such elements improve project delivery in terms of communications of stake holders	*Yes, I think communication will be improved when we have another information system; not this one we are using because to be honest with you it is not very useful in terms of project management.*
What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents	*Is very difficult to be able to tell you what type of project management information modelling system, but I think that's your job as students, that's what you get to look at and then you give us what you think and then we can talk about it another day; and then maybe it can tell you why it is what you think. However, I think another project management information system is availed, since you guys are still young and you are still researching on these things, maybe you can be able to come up with something.*

INTERVIEW 4 Question	**Answer/Response summary**
What information modelling system currently used in project management sector in the context of building and construction projects in Australia?	*Project management is ready for a revolution, traditional project planning Solutions rely on people to manually adjust schedules that precedence. Liquid planner is predictive project management software for modern businesses that we use at our company but works in alliance with Building Information Modelling Systems (BIM). This is the project management information modelling system used as software for project management. The world today mostly relies on predictive planning technology; The other thing about liquid planner is that it can be able to give you a better plan. We have about 200 people in our organisation and we sometimes do about 10 projects at a time, it is a good project management software. When you use it, you will be able to focus on work and be able to make data entry in any form in time. However, there's still some pitfalls about it which are some people like us project managers that would want to be addressed so that it can be something that it can be completely relied upon for complete delivery of project management, especially in this kind of construction environment in Australia.*

How useful are these information modelling systems if any in your everyday project delivery?	*Well, I can see having used this management tool for many years it is difficult not to love this software. However, there is something that I feel that can be done— it can be able to put everything together to have one optimal IMs in order to make projects comparatively faster and be able to plan all that you need, and to be able to do things in other software like in Excel. It is difficult to give you scenarios over how difficult or how is it, but it is not too bad, it is alright, it is just a software that can be used here.*
How long have you used information modelling systems?	*I've used this software for a long time now; I think I've been using it for almost 6 years now and yes there are some things that we thought would be improved but I'm alright for now we just hope that one day a Messiah would come and help us especially in terms of project management information modelling systems.*
How do these information modelling systems collaborate with other stake holders?	*When it comes to things like stakeholder communication and collaboration, some better things could be done especially in terms of collaboration. I do not know how but I can explain this, but if you had a chance I would come and show you what I am talking about. I'm not sure if I am allowed to do that, but if you haven't experienced a lot of different project management tools it will be difficult for you to understand what I'm talking about, but if another maybe one day, if we could find another project management information system it would help us more.*

What shortfalls are you experiencing and what do you think done will be the future problems with the current	*Like in other software, I think the shortfall that we can talk about now, I could write down for you, maybe if you had given me enough chance, or if I knew what kind of questions you are going to ask, I would have been able to write down for you because there are a lot of our pros and cons. The other shortfall is in transforming from one level of project progress to the other. With another software probably it could have been better. I mean another software that could be able to be used from the origination to the end of the project without collaborating with other software.*
What would be key attributes qualities if the proposed project management information modelling system for such projects would you want	*As alluded to before, if there were a project management information modelling system that would cater from initiation until the end of the project life cycle that would really help us as project managers. Also, the major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is done punctually making sure visual aids are included making sure there is a flawless communication channel amid stake holders and the client*
Would such elements improve project delivery in terms of time, cost, and quality	*Project management knowing all the areas of property management that is about the integration of project management; how to harness the processes to ensure that all the various elements are met like project scope management, time management, cost and quality management as well as project delivery. Since the successful success of a project is moored to time management, management of the cost of project management and the overall management, better IMs solutions can improve those key elements of project management. So, if all these things are met then all things should be good— you to have a sound project.* *Yes, these elements would improve on the delivery in terms of cost time and quality*

Would such elements improve project delivery in terms of communications of stake holders	*Surely these elements will improve project delivery, and definitely have a better project management environment and communication like you are asking, about communication and a better information modelling system; definitely what we are experiencing now is not what we would prefer as project managers. I could have answered this one before yes, these elements would definitely improve communication with stake holders, and this would definitely improve communication between stake holders, because it automatically improves delivery time delivery in terms of communication and delivery.*
What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents	*It will be good to have a project life cycle and product IMs that starts from initiation, planning, project definition, and documentation as well as delivery, and until disposal that will help us a lot if we have such a good information modelling system, because without that it's surely very difficult in terms of our project management*

INTERVIEW 5 Questions	***Answer/Summary Response***
What information modelling system currently used in project management sector in the context of building and construction projects in Australia?	*As for the project management my team is responsible for managing projects small and large including new store openings Wrike is right because it gives us the visibility, flexibility, and collaborative tools we need to deliver efficient timely projects. I use Wrike software when the project team is working on a project and look for any requests that come out; your request to help at the new project opening. Do you have time to work on a new project? It is available for you always and anywhere offline. It collaborates on tasks using My Live Editor and sound real time comments, enabling so much communication without breaking down and preventing anyone from getting disabled once offline. It also attaches the latest task posted and asks for feedback using the proofing and approval out on since everyone's commentary box is always active. This reduces confusion and makes the review process quick and easy after all the feedback has been addressed. Once a task is approved, and just like that the first phase of the project it is done for you, and all you need to do is to report to track over our progress allowing us to see any potential issues that might create unnecessary delay be accounted for keeping everyone informed and most importantly delivering a project on time.*

How useful are these information modelling systems if any in your everyday project delivery?	*Well, they are very useful because you cannot run a project without this one information modelling system; you cannot do much without one information modelling system. Every project that we run, we include at least one of the information modelling systems of some sort and if we do not do that, we have project delays, paperwork accumulation because of that. But like I said this one information modelling system we use some for other things and some for the other like this Wrike, we use it for planning, it is very handy for planning but when looking at information sharing, or information transfer we find out it is not very useful; that is when we engage BIM. That is what I can say for now, they are very useful but, in some way, they are not as useful as one would want it to be. Thank you.*
How long have you used information modelling systems?	*Well, I can say we have been using these information modelling systems since 2013 and since that time we have not changed; we have always been using these information modelling systems; the IPQ like I told you it has been handy from 2013-2018— it's about 5 years*
How do these information modelling systems collaborate with other stake holders?	*Said before it is very ok to use this IMs, but we have one big challenge with it; one of the biggest challenges is that it is not able to work with a lot of people at once. I will probably say, if the number of people is over 20 or so it is a bit tricky to use. Since we have a small number of about 15 employees in this company, it could work for now. Another issue also is about the multiple chat options and for displaying the timelines for projects. Finally, the most important thing that we would want is to be able to work standing on its own without other players like BIM, yeah that is where the biggest shortfall is and in terms of communicating. Lastly, it is not being able to work from the beginning to the end without encompassing other Information systems.*

What shortfalls are you experiencing and what do you think done will be the future problems with the current	*As I said before it is very ok to use this IMs, but we have one big challenge with it; one of the biggest challenges is that it is not able to work with a lot of people at once. I will probably say, if people are over 20 or so it is a bit tricky to use. Since we have a small number about 15 employees in this company, it could work for now. Another issue also is about the multiple chat options and for displaying the timelines for projects. Finally, the most important thing that we would want is to be able to work standing on its own without other players like BIM, yeah that is where the biggest shortfall is and in terms of communicating. Lastly, it is not being able to work from the beginning to the end without encompassing other Information systems software in between so it's just that's one of the problems that you face in there that I think if someone would be able to collaborate like you're saying all this software to put them in one thing and then becomes another project management information system.*
What would be key attributes qualities if the proposed project management information modelling system for such projects would you want	*One of the things that I want in the new IMs, if you are saying you are going to propose another project management information modelling system is probably of flexibility. I really want the IMs to be able to be flexible especially in terms of navigation, from navigating from one field to another and being able to clearly communicate with stakeholders easily without being caught without being channelled to another software or to another email sending software. Just being able to do everything there and be able to finally to be able to use Just One software in terms of communication.*

Would such elements improve project delivery in terms of time, cost, and quality	*When you ask me about improvement, especially the delivery yes, I think once the communication is sorted out, things like time, cost and quality should be really good as well because surely when you are talking about time, even the things like activity definition regression estimation schedule, development schedule control, all those things that have to do with time management they will enhance project delivery. Consequently, things like resource planning, control, budgeting, and estimation all those things will be improved. Once there is an information management system that can take work from the beginning to the end, I think it will be an improvement.*
Would such elements improve project delivery in terms of communications of stake holders	*When you talk about project communications, you will be talking about communication from the planning, right from the beginning planning of the project, Things like information systems can be shared between the project stakeholders and all the other people that are involved in the project. There are things like performance reporting also that improve once there is an improvement in the IMs that one uses. Just to sum up, there will be an improvement in terms of communication with stakeholders.*
What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents	*It really depends on what you think needs to be done but I think just a project management information modelling system that will enable project managers to function without any IMs hindrances. Especially in terms of the ability to stand independently with support of other systems like BIM or excel.*

INTERVIEW 6 Questions	***Answer/Summary Response***
What information modelling system currently used in project management sector in the context of building and construction projects in Australia?	*As for the project management my team is responsible for managing projects small and large including new store openings Wrike is right because it gives us the visibility, flexibility, and collaborative tools we need to deliver efficient timely projects. I use Wrike software when the project team is working on a project and look for any requests that come out; your request to help at the new project opening. Do you have time to work on a new project? It is available for you always and anywhere offline. It collaborates on tasks using My Live Editor and sound real time comments, enabling so much communication without breaking down and preventing anyone from getting disabled once offline. It also attaches the latest task posted and asks for feedback using the proofing and approval out on since everyone's commentary box is always active. This reduces confusion and makes the review process quick and easy after all the feedback has been addressed. Once a task is approved, and just like that the first phase of the project it is done for you, and all you need to do is to report to track over our progress allowing us to see any potential issues that might create unnecessary delay be accounted for keeping everyone informed and most importantly delivering a project on time.*

How useful are these information modelling systems if any in your everyday project delivery?	*Well, they are very useful because you cannot run a project without this one information modelling system; you cannot do much without one information modelling system. Every project that we run, we include at least one of the information modelling systems of some sort and if we do not do that, we have project delays, paperwork accumulation because of that. But like I said this one information modelling system we use some for other things and some for the other like this Wrike, we use it for planning, it is very handy for planning but when looking at information sharing, or information transfer we find out it is not very useful; that is when we engage BIM. That is what I can say for now, they are very useful but, in some way, they are not as useful as one would want it to be. Thank you.*
How long have you used information modelling systems?	*Well, I can say we have been using these information modelling systems since 2013 and since that time we have not changed; we have always been using these information modelling systems; the IPQ like I told you it has been handy from 2013-2018— it's about 5 years*
How do these information modelling systems collaborate with other stake holders?	*Said before it is very ok to use this IMs, but we have one big challenge with it; one of the biggest challenges is that it is not able to work with a lot of people at once. I will probably say, if the number of people is over 20 or so it is a bit tricky to use. Since we have a small number of about 15 employees in this company, it could work for now. Another issue also is about the multiple chat options and for displaying the timelines for projects. Finally, the most important thing that we would want is to be able to work standing on its own without other players like BIM, yeah that is where the biggest shortfall is and in terms of communicating. Lastly, it is not being able to work from the beginning to the end without encompassing other Information systems.*

What shortfalls are you experiencing and what do you think done will be the future problems with the current	*As I said before it is very ok to use this IMs, but we have one big challenge with it; one of the biggest challenges is that it is not able to work with a lot of people at once. I will probably say, if people are over 20 or so it is a bit tricky to use. Since we have a small number about 15 employees in this company, it could work for now. Another issue also is about the multiple chat options and for displaying the timelines for projects. Finally, the most important thing that we would want is to be able to work standing on its own without other players like BIM, yeah that is where the biggest shortfall is and in terms of communicating. Lastly, it is not being able to work from the beginning to the end without encompassing other Information systems software in between so it's just that's one of the problems that you face in there that I think if someone would be able to collaborate like you're saying all this software to put them in one thing and then becomes another project management information system.*
What would be key attributes qualities if the proposed project management information modelling system for such projects would you want	*One of the things that I want in the new IMs, if you are saying you are going to propose another project management information modelling system is probably of flexibility. I really want the IMs to be able to be flexible especially in terms of navigation, from navigating from one field to another and being able to clearly communicate with stakeholders easily without being caught without being channelled to another software or to another email sending software. Just being able to do everything there and be able to finally to be able to use Just One software in terms of communication.*

Would such elements improve project delivery in terms of time, cost, and quality	*When you ask me about improvement, especially the delivery yes, I think once the communication is sorted out, things like time, cost and quality should be really good as well because surely when you are talking about time, even the things like activity definition regression estimation schedule, development schedule control, all those things that have to do with time management they will enhance project delivery. Consequently, things like resource planning, control, budgeting, and estimation all those things will be improved. Once there is an information management system that can take work from the beginning to the end, I think it will be an improvement.*
Would such elements improve project delivery in terms of communications of stake holders	*When you talk about project communications, you will be talking about communication from the planning, right from the beginning planning of the project, Things like information systems can be shared between the project stakeholders and all the other people that are involved in the project. There are things like performance reporting also that improve once there is an improvement in the IMs that one uses. Just to sum up, there will be an improvement in terms of communication with stakeholders.*
What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents	*It really depends on what you think needs to be done but I think just a project management information modelling system that will enable project managers to function without any IMs hindrances. Especially in terms of the ability to stand independently with support of other systems like BIM or excel.*

IN 7 Question	Answer/Response summary
What information modelling system currently used in project management sector in the context of building and construction projects in Australia?	*The software that we use for project management and Information wanting system in our company is called Fresh desk. It is a cloud-based system and it normally works with the support of a technical team staff, and everything that you do is to check the project progress and manage it. I think that is suitable for project management, it is just ok especially with things like a smart automation, even the frequently asked questions section everything is there for communication.* *Fresh desk next generation help desk customer queries from phone email website and even social networking sites and one can automatically convert it into another form of document instantly solving customer problem with the simple and smart interface. Finally, any task comment comes with acknowledgement that you read and the comments with actual time and you will see a list of all tasks assigned to you. It is updated instantly based on any new changes happening across the team members. The system records all your work you cannot get that from spreadsheet get updates on the work that matters to you and your follow pass rate from the inbox. You can reduce noise and focus on what's important your dashboard is where you can see the status of all the projects you are leading working on or keeping track of at the click of a button. This product automatically populates in Google Sheets from or custom reporting into detailed reporting.*

How useful are these information modelling systems if any in your everyday project delivery?	*Well, there are difficulties one sees, and different from another person who sees how useful these information modelling systems are that we use each day for the project delivery. It is very handy, it is good yes, we use it almost daily, and it has got good and interesting features. I like message pops out some popular navigation tools. When you are using it go to help desk, you can easily navigate into it and get everything that you need there. It also has an easy information sharing; I do not know how I can explain it. This is part of what we do, however its customisation is a bit tricky, although we can use it, and we use it almost every day I like it even though there are a few things that are not working properly, well, especially the functionality.*
How long have you used information modelling systems?	*Well, you said how long I have been using this IMs; I have been using it for about 5 years now.*
How do these information modelling systems collaborate with other stake holders?	*Purpose of collaboration with a stakeholder. I think I just explained that to you about the stakeholder and collaboration; like I said to you is mostly not only meant for small projects but it's for collaboration and the ability to communicate with other stakeholders—it's not the best. Well like I said, these information modelling systems are not very user friendly when we do collaboration with other project stake holders and work without incorporating other software as well as being able to be used during the entire project.*

What shortfalls are you experiencing and what do you think done will be the future problems with the current	*I see the inability to interact with the team especially like the assigning of emails and sending emails to the correct department to the correct person in the department. If you forget to hit a forward button, then you would lose some of the information. There is a function that is called forward sorting, something like that it's difficult when you don't know the system anyway, but if you forget to do that it was almost all your work that you've done so far you will lose most of it. So, if you couldn't receive and you hit that button by mistake you lose all the work, and I've done this and I've seen that it is almost impossible to reverse what we have done.*
What would be key attributes qualities if the proposed project management information modelling system for such projects would you want	*One of the key attributes that I want on an information modelling system like this one is probably things like our being able to start and finish the project. If one can start and finish the project, then everything is good but means if everything is going on well that means everything will go well in terms of the information systems. I can see one of the biggest challenges that we are having now is for us not to be able to use one software. Now we are using different software to complete our projects. That is, you can use BIM, and use things like Auto card to make sure that you complete a project. So, when we are looking at another software, we will probably look at an information warning system that can help us in doing The Project from the beginning of the end.*

Would such elements improve project delivery in terms of time, cost, and quality	*Yes of course. Once you have a project management information modelling system, you like the way you were explaining in the beginning before the interview. Another project management information modelling as per your proposal or something would increase the production in the Project. That will increase and improve the product delivery in terms of time, cost, and quality. And once time, cost in quality is in place the project is good because it will be fun. If time, cost, and quality are done, then everybody is happy, so if we get those things done. That would be much better and improve project delivery in terms of time, cost, and quality.*
Would such elements improve project delivery in terms of communications of stake holders	*As I explained before, if there were another project management information modelling system that would cater for project management from the beginning to the end, that is from my initiation until maybe to disposal, elements like communication, in general, and delivery of projects would definitely improve.* *That's just my thought but we are yet to see if the best information modelling system comes or you can play; we'll just see how it goes but if I can see things that should be good. And there should be an improvement in terms of our communication and delivery of projects.*
What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents	*That is a tricky a question, the project management structure that we will be hoping to be looking at is something that can be able to address the ability to communicate between team members and stakeholders.*

INTERVIEW 8 Question	**Answer/ Summarised Response**
What information modelling system currently used in project management sector in the context of building and construction projects in Australia?	*ASANA is a IMs that we use at our company. To find our company's teams in projects, and teams like marketing design, and Human Resources Asana makes it very easy. Asana can be used to run an entire organization making it easy for all teams to better collaborate amongst themselves and with each other. The whole conversation calendars in projects gives one a bird's eye view of everything relating to projects. With this IMs, you can also see a couple of examples of custom fields with columns for contents page, you can create drop down text or numeric fields to track anything from task priority to marketing a channel to the application fill & beyond—you can sort by customer fields With ASANA, there is even more tabs to see your work organised in the way that works best for you and the additional part of your tabs let you access all the product information you need to use in conversations instead of an email chain to communicate with products they called it; you can at mention the relevant test. So, everyone can easily see the details of the work you did. Additionally, you can also create new conversations directly through email; it's like a Google group or Facebook group for Work Calendar which shows all of your test date ranges in lines making it easier to schedule work and have a clear sense of your project timeline, promiscuity post status updates with red, yellow and green indicators. You can sporadically find out how close your team is to achieving its goals and keep managers and executives in the loop without all the time-consuming update meetings and finally, there's a file view showing every attachment and a gallery view so you don't have to dig through folders or email to find the files you're looking for. ASANA is good for us as a project team.*
How useful are these information modelling systems if any in your everyday project delivery?	*ASANA is very useful, like if you want to lock down the editing access you can create a comment on teams as people work in different projects. We use it every day and we find it useful.*

How long have you used information modelling systems?	*I can say we have been using this information modelling system since 2015 and since that time we have not changed.*
How do these information modelling systems collaborate with other stake holders?	*You can use custom fields in stakeholder communication; for instance, you can make sure no work is lost, and by searching and transmitting an incomplete task that might be of priority. One can also save reports for quick access anytime; the report will automatically update as work progresses. ASANA is great with tools you are already using like Salesforce slack g suite and much more plus.*
What shortfalls are you experiencing and what do you think done will be the future problems with the current	*Yes, one of the disadvantages of this information system is when it is down especially when it comes to payments and collaborating with other software and workspaces within the project. One of the biggest challenges for you too but otherwise when you're doing the lack of any workarounds and there are project extensions, and when you want to try to do anything about it outside software like maybe importing exporting.*
What would be key attributes qualities if the proposed project management information modelling system for such projects would you want	*It is quite difficult to explain elaborately on how the proposed Project Information system would be of value without seeing anything. It is probably better if you could come with it with something that one could look at. Probably it will be great, however, as of now, we have a big problem especially in terms of being able to complete everything with the one project management software. You find that one of its main strengths is 10 emails; in the monetary issues it's not really more to do with project management; yes, we use it is but in terms of the pure project management it's not really compatible.*

Would such elements improve project delivery in terms of time, cost, and quality	*Most of the time in project management where you lose money is why you cannot couple this three things, time, cost, and quality. If these things are not coupled properly a client will definitely lose money, and that's where you find that project managers will start abandoning a project and are going somewhere in hideouts or something without seeing where they're going— it's because of the time cost and quality. If anything, that has to do with the improvement in the project management information modelling fraternity, then that means that the cost in quality will be more enhanced.*
Would such elements improve project delivery in terms of communications of stake holders	*I think yes, these elements would definitely improve communication with stake holders; this would definitely improve communication between stake holders because it automatically improves delivery time delivery in terms of communication and delivery as a whole that would definitely improve since communication is the key to the project— it would be good.*
What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents	*I would probably propose a project management information System that is easy for our project managers. I think if someone can come up with any information modelling system, or if you are given a chance to point out what we have or how it would look \, I think you could look at any information. That I think we should look if there are any current in project management information systems if they are there, like Building Information modelling system would be good but being tailor made for project management.*

8.3 Questions and answers to focus group discussion questions.

Table 21: Questions and answers to focus group discussion questions.

Interviewee and questions	Common Themes	key words
1. Focus group discussion questions 1. What is your view regarding that interviews results that there less utilisation of IM systems amongst the construction firms in the project management fraternity? 2. What is your view regarding the proposal to embrace the recommendation for adoption of a PMIM system? 3. What is your view regarding that interviews results which established that PMIM system adoption would improve the projects performance, in terms of time, cost and quality? 4. What is your view regarding the interview's outcome that a proposed PMIM would extend a project life cycle that have stages that start from initiation, planning, project definition, documentation as well as delivery until disposal?	1. *According to me the information systems that are being talked about in the interviews are correct and I think they are very applicable when it comes to project management. In my view I will embrace the recommendation for adoption of a PMIM system.* 2. *I also definitely think that the results that are obtained from the proposed adoption of the project management information modelling system will increase the project performance in terms of time went through on the project the quality and the general costs of the project.* 3. *Well in terms of extending the life cycle as proposed in the PMIM, it is difficult to say how much it will extend the project from Initiation to documentation or disposal. Also, there are very useful because you essentially cannot run a project without an information modelling system; you cannot do much professionally without one information modelling system.* 4. *Well like I said before if there were an information modelling system that would cater from initiation until the end of the project life cycle that would really help, in saying that, yes, definitely these elements would improve the project delivery in terms of time, cost and quality since each project is secured on time cost and quality so these are the things that would be making sure should be achieved*	*-Building Information Modelling Systems (BIM)* *- cater from initiation until the end.* *- improve the project delivery* *- time cost and quality*

2. Focus group discussion questions 1. What is your view regarding that interviews results that there less utilisation of IM systems amongst the construction firms in the project management fraternity? 2. What is your view regarding the proposal to embrace the recommendation for adoption of a PMIM system? 3. What is your view regarding that interviews results which established that PMIM system adoption would improve the projects performance, in terms of time, cost and quality? 4. What is your view regarding the interview's outcome that a proposed PMIM would extend a project life cycle that have stages that start from initiation, planning, project definition, documentation as well as delivery until disposal?	1. *From my own assessment, what I saw from your interviews and all the questions we asked answered in and there are inconsistencies and looks like everything was up-to-date, and I believe these are good reports in terms of what you got out of those interviews. I also want to contribute saying that the proposal to embrace the recommendation for adoption of this new system is something that I will go for as a project manager who has been a honing project manager for a long time, I would want to give it a go.* 2. *In terms of how this embracing of the new system would help in terms of improving projects time project cost in the project quality, I think if this is embraced somehow our time I will because you know quality of projects will improve from where they are now.* 3. *In terms of the outcome whether this will extend the project life cycle from the stages of initiation learning project definition documentation as well is disposal, it is difficult for me to really say whether it will increase or not but from what I have seen and from what I've heard other people seeing person to speak before me I think it will definitely increase the stages of project management.* 4. *I will give you an example: if you want to make a project life cycle from the beginning to the end it is difficult. Harmoniously, by improving on our time and cost we would now be using less time to transfer from one program to another and that would help us especially if you want to track your time and costing of the project, and even the quality.*	*- used to use just Excel.* *- very handy for planning* *- by improving on our time and cost* *- to track your time and costing of the project*

3. Focus group discussion questions 1. What is your view regarding that interviews results that there less utilisation of IM systems amongst the construction firms in the project management fraternity? 2. What is your view regarding the proposal to embrace the recommendation for adoption of a PMIM system? 3. What is your view regarding that interviews results which established that PMIM system adoption would improve the projects performance, in terms of time, cost and quality? 4. What is your view regarding the interview's outcome that a proposed PMIM would extend a project life cycle that have stages that start from initiation, planning, project definition, documentation as well as delivery until disposal?	1. *When you do interviews you expect different results and expect different people to see different views but according to what I've seen, according to what these interviews are looking like I think they've got a true indication of what really happened and what is happening in the project management fraternity. It is also important to see how our people kept on talking about some issues especially about the adoption of the new system of project management.* 2. *In my view the proposal to embrace the recommendation in the adoption of this project management information modelling system is a noble idea and I think most people will also like it because we are going into the 21st-century now and things surely must change since project management has always stayed behind and has never moved from the early 80s.* 3. *The recommendation of this adoption, I think in my view, it will improve projects in terms of performance of projects and in terms of time, cost, and the quality of the ventures, and keep in mind most of the project that we do are in construction, so I think this will definitely increase the production of quality projects and done in time and of good quality and its reasonable cost.* 4. *The life cycle for project management has only been thought that it starts from initiation until closing but according to what you are saying and according to what you are suggesting through your findings, eye-opening and I think the embracing of this project management information modelling system will help us to realise that it only does not start it to initiation, but it's also goes further and finish at demolition.*	*- It also deals with things like time planning* *- resource planning* *- project management solutions*

4. Focus group discussion questions 1. What is your view regarding that interviews results that there less utilisation of IM systems amongst the construction firms in the project management fraternity? 2. What is your view regarding the proposal to embrace the recommendation for adoption of a PMIM system? 3. What is your view regarding that interviews results which established that PMIM system adoption would improve the projects performance, in terms of time, cost and quality? 4. What is your view regarding the interview's outcome that a proposed PMIM would extend a project life cycle that have stages that start from initiation, planning, project definition, documentation as well as delivery until disposal?	1. *According to me the information systems that are talked about in the interviews are correct and I think they are very applicable when it comes to project management. Also, in my view I will embrace the recommendation for adoption of a PMIM system.* 2. *I also definitely think that the results that are obtained for the adoption of the project management information modelling system will increase the project performance in terms of time spent on the project the quality and the general costs of the project. Additionally, they are very useful because you essentially cannot run a project without an information modelling system; you cannot do much without one information modelling system.* 3. *-Also, the major attributes I would want in such a PMIMS project management information modelling system would be making sure the communication is done punctually making sure basic project essentials, time, coast and quality are included making sure there is no problem in the communication channel amidst stake holders and the client.* 4. *Well in terms of extending the life cycle is proposed in the PMIM, it is difficult to see how much it will extend the project from initiation to disposal. Since the success of a project is moored to time management, management of the cost of project management and the overall management, better IMs solutions can improve those key elements of project management*	*- used to use just Excel.* *- by improving on time and cost* *project* *-Building Information Modelling Systems (BIM)* *- cater from initiation until the end.* *- time cost and quality*

5. Focus group discussion questions Interviewee questions 1. What is your view regarding that interviews results that there less utilisation of IM systems amongst the construction firms in the project management fraternity? 2. What is your view regarding the proposal to embrace the recommendation for adoption of a PMIM system? 3. What is your view regarding that interviews results which established that PMIM system adoption would improve the projects performance, in terms of time, cost and quality? 4. What is your view regarding the interview's outcome that a proposed PMIM would extend a project life cycle that have stages that start from initiation, planning, project definition, documentation as well as delivery until disposal?	1. *From my own valuation what I saw from your interviews is that all the questions we asked answered in and there are more discrepancies and looks like everything was up-to-date and I believe these are good report in terms of what you got out of those interviews in terms of the results.* 2. *I also want to contribute saying that to the proposal to increase the recommendation for adoption of this new system is something that I will go for is a project manager may be a practicing project manager for a long time I will want to sample it out. However, IMs could be together to have one optimal IMs to make projects comparatively faster and be able to plan all that you need, and to be able to do things in other software like in Excel.* 3. *As alluded to before, if there were project management information modelling system that would cater from initiation until the end of the project life cycle that would really help us as project managers.* 4. *Well like I said before if there were an information modelling system that would cater from initiation until the end of the project life cycle that would really help. Yes, these elements would improve the extend delivery in terms of time, cost and quality since each project is secured on time fetched and quality so these are the things that would be making sure should be achieved*	*- cater from initiation until the end.* *- improve the project delivery* *- time cost and quality* *- resource planning* *- project management solutions*

6. Focus group discussion questions 1. What is your view regarding that interviews results that there less utilisation of IM systems amongst the construction firms in the project management fraternity? 2. What is your view regarding the proposal to embrace the recommendation for adoption of a PMIM system? 3. What is your view regarding that interviews results which established that PMIM system adoption would improve the projects performance, in terms of time, cost and quality? 4. What is your view regarding the interview's outcome that a proposed PMIM would extend a project life cycle that have stages that start from initiation, planning, project definition, documentation as well as delivery until disposal?	1. *According to what your interviews are looking like I think they have got a true signal of what really happened and what is happening in the project management fraternity. It is also important to see how our people kept on talking about some issues especially about the adoption of the new system of project management.* 2. *In my view the proposal to embrace the recommendation in the adoption of this project management information modelling system is a good idea and I think most people will also like it because we are going like the idea. In terms of how this embracing of the new system would help in terms of improving projects time project cost in the project quality, I think if this is embraced.* 3. *I think this will increase the production of quality projects and done in time and of good quality and its affordable cost. The life cycle in project management does not only start from initiation until closing but according to what you are saying but it also goes feather and finish at documentation.* 4. *Once there is an information management system that can take work from the beginning to the end, I think it will be an improvement. One of the key attributes that I want on an information modelling system like this one is probably things like our being able to start and finish the project. Once there is an information management system that can take work from the beginning to the end, I think it will be an improvement.*	*-anywhere offline* *- Able to start and finish the project.* *- by improving on our time and cost* *- to track your time and costing of the project*

7. Focus group discussion questions 1. What is your view regarding that interviews results that there less utilisation of IM systems amongst the construction firms in the project management fraternity? 2. What is your view regarding the proposal to embrace the recommendation for adoption of a PMIM system? 3. What is your view regarding that interviews results which established that PMIM system adoption would improve the projects performance, in terms of time, cost and quality? 4. What is your view regarding the interview's outcome that a proposed PMIM would extend a project life cycle that have stages that start from initiation, planning, project definition, documentation as well as delivery until disposal?	1. *It imperative to see how our people kept on talking about some issues especially about the adoption of the new system of project management.* 2. *In my view the proposal to embrace the recommendation in the adoption of this project management information modelling system is a fantastic idea and I think most people will also like it because we are going into the new year now and things certainly must change project management is always been stagnant in terms of information systems. In my view, the adoption of this PMIM and recommendation I think in my view into your regarding performance of projects are regarding time, cost and the quality of the increase the production of quality projects and done in time and of good quality and it reduced cost.* 3. *Well like I said before if there were an information modelling system that would cater from initiation until the end of the project life cycle that would really help. Yes, these elements would improve the project extend delivery in terms of time, cost and quality since each project is secured on time fetched and quality so these are the things that would be making sure should be achieved.* 4. *One of the key attributes that I want on an information modelling system like this one is probably things like our being able to start and finish the project and there should be an improvement in terms of our communication and delivery of projects.*	*- to check the project progress* *- collaboration with a stakeholder* *- communicate with other stakeholders.* *-by improving on our time and cost*

8. Focus group discussion questions 1. What is your view regarding that interviews results that there less utilisation of IM systems amongst the construction firms in the project management fraternity? 2. What is your view regarding the proposal to embrace the recommendation for adoption of a PMIM system? 3. What is your view regarding that interviews results which established that PMIM system adoption would improve the projects performance, in terms of time, cost and quality? 4. What is your view regarding the interview's outcome that a proposed PMIM would extend a project life cycle that have stages that start from initiation, planning, project definition, documentation as well as delivery until disposal?	1. *I believe these are good report in terms of what you got out of those interviews in terms of the results, and from my own assessment what I saw from your interviews all the questions we asked answered in and there are more incongruities.* 2. *Yes, one of the potential disadvantages of adopting this information system is compatibility especially when it comes to networking and collaborating with other software and workspaces within the project.* 3. *Most of the time in project management where you lose money is why you cannot separate these three things, time, cost, and quality. If anything, that has to do with the improvement in the project management information modelling fraternity, then that means that the cost in quality will be more enhanced.* 4. *Well they are very useful because you essentially cannot run a project without an information modelling system; you cannot do much without one information modelling system.Also the major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is up to standard.Correspondingly, by improving on our time and cost it would now be able to help especially if you want to track your time and costing of the project, and even the quality.*	*- makes it very easy* *- collaborating with other software* *- workspaces within the project* *-- by improving on our time and cost*

8.4 Ethics Approval report

Research Master

Human Ethics Application

Human Research Ethics Amendment Application

Edit your original HRE application, by clicking the **EDIT** button at the bottom of this page, to reflect the amendments that apply to this application. Take care to read through all sections to ensure your responses remain current and relevant to the proposed changes.

Complete and submit this amendment application and attach any revised supporting documentation (if required).

An HRE Officer will generate a report to track the changes you have made to your original application and will be in contact with you following review of this amendment application.

Click the green arrow to go to the next page.

Amendment Overview

Amendment Overview

Does this amendment request involve a change to?

Project title? *

○Yes◉No

Investigators joining and/or leaving the project? *

○Yes◉No

The overall research aims and/or research questions of the project? *

○Yes◉No

Addition of a new data collection method/s? *

○Yes◉No

Addition of a new data collection location/s? *

○Yes◉No

The data collection instruments, such as survey, interview or focus group questions? *

◉Yes○No

Addition of a new participant group/s? *

○Yes◉No

The participant information sheet, explanatory statement, or consent forms? *

○Yes◉No

An extension to your approval period? *

◉Yes○No

Indicate the revised end date you are requesting. *

29/06/2019

Any other changes? *

○Yes◉No

Review outcome comments for ***Amendment Overview***.

This question is not answered.

Click the green arrow to go to the next page.

Application Type

1 Application Type

Ethics category*

Human Research Ethics Application

1.1 Has this application been reviewed and approved by another Human Research Ethics Committee (HREC)?

Select "Yes" if your project has already been approved by a human research ethics committee (HREC) that is not operated by the University of Southern Queensland, (i.e., you wish to register your ethics approval with USQ). Select "No" if the University of Southern Queensland Human Research Ethics Committee will review and approve your proposed research.

*

○Yes◉No

1.2 Does this research project involve? Tick all that apply.

- ☑ Collection of information/observations/bio specimens (e.g., blood, tissue) from human participants
- ☐ Use of existing documents, data sets or archival data (Inc. Internet sourced) containing human info
- ☐ Use and/or disclosure of existing bio specimen collections
- ☐ Any form of genetic testing or analysis of genetic material
- ☐ Clinical trial

Review outcome comments for ***1 Application Type***.

This question is not answered.

Click the green arrow to go to the next page.

2 Potential Participant Group

Does this project involve (a) the direct recruitment of participants that specifically targets, and/or (b) the use of existing data and/or tissue of participants from a project that specifically targeted…?

2.1 Women who are pregnant, the human foetus, or human foetal tissue? *

○Yes◉No

2.2 Children or young people under the age of 18 years? *

○Yes◉No

2.3 People with a cognitive impairment, an intellectual disability, or a mental illness? *

○Yes◉No

2.4 People considered to be a forensic or involuntary patient? *

○Yes◉No

2.5 People with impaired capacity for communication? *

○Yes◉No

2.6 Prisoners or people on parole? *

○Yes◉No

2.7 People highly dependent on medical care, including a person who is unconscious? *

○Yes◉No

2.8 Military personnel? *

○Yes◉No

2.9 Military veterans? *

○Yes◉No

2.10 People who would not usually be considered vulnerable but would be considered vulnerable in the context of this project? *

○Yes◉No

2.11 Aboriginal and/or Torres Strait Islander peoples? *

○Yes◉No

2.12 Hospital patients? *

○Yes◉No

2.13 People in other countries? *

○Yes◉No

2.14 People who would consider English to be their second language? *

○Yes◉No

Review outcome comments for ***2 Potential Participant Group***.

This question is not answered.

Click the green arrow to go to the next page.

3 Proposed Procedures

Does this project include...

3.1 Any physical, psychological, social, economic, and/or legal risks greater than inconvenience or discomfort, in either the short or long term, resulting from participation in, or use of data in this project? *

○Yes◉No

3.2 The collection and/or analysis of any biological material obtained from a person (e.g., tissue, blood, urine, sputum, or any derivate of these such as cell lines) in laboratory-based research? *

○Yes◉No

3.3 Generating, gathering, collecting, conveying or using genomic data, information, or biological materials (such as germline/germ cells or somatic cells) that has **hereditary implications** and/or **is predictive of future health** in research involving participants, relatives and other family members? *

○Yes◉No

3.4 Research intended to study and/or expose illegal activity? *

○Yes◉No

3.5 Radioactive substances and/or ionising radiation? *(e.g., DXA, X-ray)* *

○Yes◉No

3.6 Sensitive and/or contentious issues? *(E.g., suicide, eating disorders, body image, trauma, violence, abortion, etc.)* *

○Yes◉No

3.7 Toxins, mutagens, teratogens, or carcinogens? *

○Yes◉No

3.8 Deception of participants, concealment, or covert observation? *

○Yes◉No

3.9 Seeking disclosure of information which may be prejudicial to participants? *

○Yes◉No

Review outcome comments for ***3 Proposed Procedures***.

This question is not answered.

Click the green arrow to go to the next page.

4 Operational Requirements

Does this project involve...

4.1 Accessing data about and/or prospective recruitment of **USQ Students**? *

○Yes◉No

4.2 Accessing data about and/or prospective recruitment of **USQ Staff**? *

○Yes◉No

4.3 International travel for data collection purposes? *

○Yes◉No

4.4 Collecting data in a rural and remote setting? *

○Yes◉No

4.5 The collection, use or disclosure of IDENTIFIABLE personal information (e.g., names and contact details on consent forms) *

○Yes◉No

4.6 The collection, use or disclosure of RE-IDENTIFIABLE personal information (e.g., when identifying details are replaced by codes, pseudonyms, etc.) *

○Yes◉No

4.7 The collection of information by observing participants **WITHOUT** their knowledge? *

○Yes◉No

Review outcome comments for ***4 Operational Requirements***

This question is not answered.

Click the green arrow to go to the next page.

Application Detail

5 Project Title and Summary

Researchers are encouraged to read Chapter 3.1 of the National Statement on Ethical Conduct in Human Research, 2007 (updated 2018). A critical feature of good research is clarity regarding how the research project will meet the ethical requirement that research has merit, as described in paragraph 1.1 of the National Statement. **The Elements of Research**, outlined in this chapter, offer advice and guidance about meeting this obligation and will assist you in completing this application across the following sections:

<="" p="" style="text-indent: 40px;">Element 1: Research scope, aims, themes, questions, and methods

<="" p="" style="text-indent: 40px;">Element 2: Recruitment

<="" p="" style="text-indent: 40px;">Element 3: Consent

<="" p="" style="text-indent: 40px;">Element 4: Collection, use and management of data and information

<=”” p=”” style="text-indent: 40px;">Element 5: Communication of research findings or results to participants

<=”” p=”” style="text-indent: 40px;">Element 6: Dissemination of research outputs and outcomes

<=”” p=”” style="text-indent: 40px;"> Element 7: After the project.

5.1 Project Title*

The lack of information modelling systems across all project management phases that are contributing to the failure of some building and construction projects in Australia.

5.2 Using plain language, provide a succinct description of the background and the potential significance of the research project. *

This research project will investigate an emerging disruption in the construction and building sectors from the apparent slow uptake of information modelling (IM) systems in project management practices. IM systems currently assist in the design and construction phases of building and construction projects and help to create a collaborative process involving the project team, owners, contractors, and designers during those phases. Existing modelling systems include Building Information Modelling (BIM), Building Environment Modelling (BEM), Building Energy and Environment Modelling (BEEM) and Building Performance Modelling (BPM).

5.3 Clearly state (a) the project aims; and (b) the research questions and/or hypotheses. *

To determine if a project management IM system (PMIM) can be developed to provide better project outcomes in the context of building and construction projects in Australia, and if so, what would be the key attributes of such a system.

Review outcome comments for ***5 Project Title and Summary***.

This question is not answered.

Click the green arrow to go to the next page.

6 Investigators

6.1 Enter the Academic Organisation Unit (AOU) (six-digit project code) that will be aligned to this project.

Search for the AOU by entering a portion of your school or centre (e.g., end, health, spy, edu, sci) in the text box, then clicking on the magnifying glass. Choose the appropriate AOU code from the list returned and tab out of the text box. Attempt to select AOU that reflect school-level units rather than broader faculty-level units.

If the Principal Investigator for this project is NOT affiliated with the University of Southern Queensland, enter “EXTERNAL”.

*

Commerce

6.2 Principal Investigator

The Principal Investigator **must be a USQ Employee.** Additional investigators (including student researchers) can be added in section 6.3 of this form application.

The Principal Investigator (PI) of this project will hold ultimate responsibility for the ethical conduct of the research project in accordance with the University’s Research Code of Conduct Policy, The Australian

Code for the Responsible Conduct of Research, 2018,and the National Statement on Ethical Conduct in Human Research, 2007 (updated 2018).

The PI must ensure that all investigators involved in the conduct of this research project understand and accept their roles and responsibilities.

To complete this section…

Click on the hyperlinked investigator's name and complete all required fields (indicated with *). Ensure the "Primary Contact" is checked to "Yes". Click on "OK".

1	Order	1
	RIMS Code	0000173928
	Position	Principal Investigator
	Title	Mr
	First Name	Agrippa
	Last Name	Chifeya
	Full Name	Mr Agrippa Chifeya
	Student Researcher?	Yes
	Primary Investigator?	Yes
	Primary Contact?	Yes
	ORCID ID (if known)	
	Email Address	W0096569@umail.usq.edu.au
	Secondary Email	
	Mailing Address Address Line 1	
	Address Line 2	
	Address Line 3	
	Address Line 4	
	Suburb/City	
	State	
	Postal Code	
	Country	Australia

	Contact Phone	
	Mobile Phone	

6.3 Other **Investigators**

List all investigators associated with this project and their role (including supervisors of student research projects).

To complete this section…

Enter the investigator's first name in the text box and click on the magnifying glass. Choose the correct investigator from the list returned. Repeat this step to add all investigators.

For each investigator listed, click on the hyperlinked investigator's name, and complete all required fields (indicated with *). Ensure the "Student Researcher" question has been answered and that the Primary Contact is checked to "No".

Click on OK.

To add an External Collaborator, click on the "Add External Person" button and complete all required fields (indicated with *) and OK.

1	Order	1
	RIMS Code	0000157221
	Position	Co-Investigator
	Title	Associate Professor
	First Name	David
	Last Name	Thorpe
	Full Name	A/Pr David Thorpe
	Student Researcher?	No
	Primary Contact?	No
	Person Type	Internal
	ORCID ID (if known)	
	Email Address	David.Thorpe@usq.edu.au
	Secondary Email	
	Mailing Address Address Line 1	
	Address Line 2	

	Address Line 3	
	Address Line 4	
	Suburb/City	
	State	
	Postal Code	
	Country	Australia
	Contact Phone	
	Mobile Phone	

Review outcome comments for ***6 Investigators***.

This question is not answered.

Click the green arrow to go to the next page.

7 Benefit and Risk

7.1 Outline the benefits to participants and/or to the community because of this research being conducted. *

To develop project management IM system (PMIM)which can be used to provide better project outcomes in the context of building and construction projects in Australia, and if so, what would be the key attributes of such a system.

7.2 Define the risks, in either the short and/or long term, of participation in this project *(e.g., physical, psychological, social, economic, or legal risks greater than inconvenience or discomfort)* *

Lost information and data.
Lack of enough resources for data collection
Time imposition on participants

7.3 Are all these risks outlined in the Participant Information Sheet or within the explanatory statement at the beginning of a data collection instrument, and (where relevant) on the consent form? *

◉Yes ○No

7.4 Outline the arrangements planned to minimise the risks involved in this project. *

There will be minimal risk since questions are structured to reduce time imposition

7.5 What will you do in cases where unexpected events or emergencies occur as a result of participation in this project?
For example, what facilities or services are available to deal with events such as adverse drug reaction, revelation of child abuse, illegal activities, participant becomes distressed during or after data collection. *

Inform the University, supervisor and HOD if the issue is not an emergency, if it is an emergency, then call the emergency services as soon as possible and stop the interview.

7.6 Is an appropriate list of referral services available within the Participant Information Sheet or explanatory statement? *

○Yes○No◉Not applicable.

7.7 Outline the strategies that you have in place to reduce any risks to the researchers. *

Explaining the process of conducting research to avoid preconceived ideas. Remaining polite and respectful even if a difference in opinion arises. Making sure the meet place is not an awkward or secluded place

Review outcome comments for ***7 Benefit and Risk***.

This question is not answered.

Click the green arrow to go to the next page.

8 Type of Research

Type of research - 1

8.1 Are you, as the Principal Investigator, a current USQ employee or student? *

◉Yes○No

8.1.1 Will this project be undertaken **predominately** in a student capacity? *

◉Yes○No

8.1.1.1 Program level: *

- ○ Honours
- ○ Masters
- ◉ Doctoral
- ○ Other

8.1.1.2 Program name: *

DBAR

8.1.2 Will this project be undertaken as a **USQ Course project**? *

○Yes◉No

8.2

Type of research - 2

Tick all that apply.

*

- ☐ Action research
- ☐ Clinical research
- ☑ Qualitative
- ☐ Social science
- ☐ Other
- ☐ Epidemiological
- ☐ Mental health
- ☐ Public health and safety
- ☐ Quantitative

☐ Case study
☐ Clinical trial / use of drug or therapeutic device
☐ Medical research
☐ Oral history / biographical

Review outcome comments for ***8 Type of Research***.

This question is not answered.

Click the green arrow to go to the next page.

9 Conflict of Interest

9.1 Do any of the investigators on this project have an actual, perceived, or potential personal or financial conflict of interest in the outcomes of this research, or in any of the organisations involved with, or funding this project? *

○Yes◉No

Review outcome comments for ***9 Conflict of Interest***.

This question is not answered.

Click the green arrow to go to the next page.

10 Funding

10.1 Has funding been obtained for this project? *

○Yes◉No

10.1.1 Are you applying for funding for this project? *

○Yes◉No

Review outcome comments for ***10 Funding***.

This question is not answered.

Click the green arrow to go to the next page.

11 Data Access and Security

11.1 Outline the minimum recommended Research Data storage options (i.e., 1 x primary and 2 x back-up) that you will utilise for the duration of your research project and beyond. Refer to the University's Research Data Management Policy and Research Data Management Procedure to ensure your proposed practice is suitable.*

All data will be kept in a safe on USQ cloud storage for up to 5 years and concert forms for 15 years. The information will be available to other researchers and anonymity will be guaranteed since the participants will be coded.

11.2 Will any individual or organisation external to the University of Southern Queensland (i.e., a third party) have access to the Research Data during the conduct of this research? *

◉Yes○No

11.2.1 Explain how the participants will be informed about third party access to their data and outline how you will ensure that their privacy is protected during the data transfer process to the third party. *

The information will be available to participants and anonymity will be guaranteed since the participants will be coded.

11.3 Do you plan to make available (or share) all, or part, of the Research Data via open access, restricted access, mediated access or as metadata only?
Note: It is recommended that unless your data can not be shared for ethical, privacy or confidentiality matters, that you incorporate the future use of data in your research design and include a statement within the participant information sheet/explanatory statement to this effect.*

◉Yes ○No

11.3.1 Outline the research data to be openly or publicly available and the strategy of how this will be shared (e.g., open access, restricted or mediated access, metadata only). *

The information will be available to public and anonymity will be guaranteed since the participants will be coded.

11.4 Are the data access and security arrangements detailed in the Participant Information Sheet or explanatory statement? *

◉Yes ○No

11.5 Will the Research Data be securely retained indefinitely for future use?

○Yes ○No

This question is not answered.

Review outcome comments for ***11 Data Access and Security***.

This question is not answered.

Click the green arrow to go to the next page.

12 Communication of Research Findings to Participants and Dissemination of Project Outputs

12.1 Indicate in which format/s the research findings will be communicated to participants and research outputs disseminated
Tick all that apply. *

☑ Thesis
☐ Journal article
☐ Book / book chapter
☐ Conference
☐ Dataset
☐ Reports to participants
☐ Report to organisation
☐ Report to community or group
☐ Other

12.2 How will the identity of participants be disclosed in the dissemination of research outputs? *

☑ non-identifiable data
☐ re-identifiable data
☐ individually identifiable data
☐ other

12.3 Describe how participants and/or other interested stakeholders will be able to access the research findings and/or request a copy of a summary of the results.

Note: Provision of a theses/dissertation/exegesis to a participant is not considered to be timely and appropriate summary of the research findings or results.

*

They will need to communicate with the researcher, and a summary of findings will be provided.

12.4 Will participants be subjected to any physiological or psychological testing during this project? *

○Yes◉No

Review outcome comments for ***12 Communication of Research Outcomes***.

This question is not answered.

Click the green arrow to go to the next page.

No. of Human Participant Groups

Participant Group Recruitment

PG - How many groups of participants will you be recruiting and/or observing for this research project? *

2.00

This question is asking you to think about how many groups of participants you are likely to recruit as part of this project. The method of participant recruitment and how they will provide consent may change depending on the participant's age and how you propose to conduct that part of the project.

For example:

- If you are conducting an online survey, followed by interviews with some of the survey participants, it is likely that you will recruit "2" groups. This will be the "survey group" and the "interview group".
- If you are conducting multiple focus groups with the same focus group questions, it is likely that you will recruit "1" group but offer the same content multiple times. This can be conveyed in the next section.
- If you are conducting interviews with different groups, for example, students, teachers, and school principals, then it is likely that you will recruit "3" groups.

The number of groups of participants you enter here will provide specific questions in the next section relevant to that group. That is, Group 1 = G1, Group 2 = G2, Group 3 = G3, and so on.

Sufficient space has been provided for up to **five** participant groups. If you propose to use more than five participant groups in your research, contact the Ethics Officer for further advice.

Review outcome comments for ***Participant Group Recruitment***.

This question is not answered.

Click the green arrow to go to the next page.

Group 1 - Participant Recruitment and/or Observation

G1 - Participant Overview

PG1.1 Participant group 1 working title. *(e.g., student focus group; teacher survey)* *

Project managers

PG1.2 How many participants are expected to be recruited in this group? *

8.00

PG1.3 Describe who the participants in this group are. *

Project managers who have a vast experience in the sector

PG1.4 Where will this group of participants be recruited from? *

Australian Institute of Project Managers

PG1.5 Are the participants in this group likely to be under 18 years of age? *

○Yes◉No

PG1.6 Is there a pre-existing (unequal) relationship between the participants, and anyone involved in recruiting and/or collecting data from this group of participants? *(E.g., teachers and/or lecturers/students, doctors/patients, employers/employees, etc.)* *

○Yes◉No

PG1.7 Do these participants have any cultural needs? *(e.g., specific consent arrangements or sensitivities, etc.)* *

○Yes◉No

Review outcome comments for ***G1 - Participant Overview***.

This question is not answered.

Click the green arrow to go to the next page.

G1 - Recruitment Method

PG1.8 Do you have any criteria for the selection, inclusion, or exclusion of participants for this group to take part in the research? *(e.g., minimum age requirements)* *

○Yes◉No

PG1.9 Indicate which method/s you will use to recruit these participants: *

- ☑ Email
- ☑ Personal contacts
- ☐ Telephone
- ☐ Advertisement
- ☐ Mail out
- ☐ Snowballing
- ☐ Participants from another study
- ☐ Participants approached in person by research team
- ☐ Participants will NOT be actively recruited - they will be observed without their knowledge
- ☐ Other

PG1.10 Indicate how you will obtain the contact details of these participants. *

- ☐ From the participants themselves

☐ From a public domain source

☑ From a private or third-party source

☐ Other

PG1.10.1 Provide details about this source and its terms of use. *Please note that obtaining identifiable personal information without consent may constitute a breach of Queensland and Australia privacy legislation.* *

Australian Institute of Project Managers Group, provides a platform for project managers to interact, permission will be sought from individual participants.

PG1.11 Explain who will invite these participants to be involved in this project. *

AIPM Group discussion invitation

PG1.12 Will you be offering payment or any other incentives to this group of participants? *

○Yes◉No

Review outcome comments for ***G1 - Recruitment Method***.

This question is not answered.

Click the green arrow to go to the next page.

G1 - Data Collection Methods

PG1.13 Will you collect data via questionnaires / surveys? *

○Yes◉No

PG1.14 Will you collect data via interviews or focus groups? *

◉Yes○No

PG1.14.1 Provide further detail about the **interviews or focus groups**, including: how many sessions will be held; where and at approximately what time (or timeframe) will the sessions be held; who will be present from the research team; how many participants will be present at each session; who will conduct or facilitate the session; will there be a debriefing process (and if yes, what will this involve)?

Attach a copy of your interview or focus group questions (if known) or broad topics in the document upload section.*

Data collection will be through interviews. The copy and questions to be asked is attached. The duration of the interview will.be about 20mins. It will be held at a neutral venue of the participant's choice. The researcher will facilitate the interview.

PG1.14.2 Will your interview or focus group session be audio or video recorded? *

◉Yes○No

PG1.14.3 Will you arrange for transcription of the audio or video recording? *

◉Yes○No

PG1.14.3.1 Provide detail on how you will handle the transcription process of the audio or video recording, including who will be involved in transcribing the data, whether the participants will be provided an opportunity to review and/or edit the transcribed document, and how you will safely manage the data transfer process. *

The transcription process will be done by the researcher and data will not be sent to the participants; however, they will be provided a summary of findings of they need to know.

PG1.15 Will you collect data via observation? *

○Yes◉No

PG1.16 Will you collect data via photography / videography? *

○Yes◉No

PG1.17 Will you collect data via psychological inventories or any other published, standardised test? *

○Yes◉No

PG1.18 Will you collect data via collection of human bio specimens? *

○Yes◉No

PG1.19 Will you collect data via responses to tasks, stimuli, or simulations? *

○Yes◉No

PG1.20 Will you collect data via administration of a substance? *

○Yes◉No

PG1.21 Will you collect data via any other procedure not outlined above? *

○Yes◉No

Review outcome comments for ***G1 - Data Collection Methods.***

This question is not answered.

Click the green arrow to go to the next page.

G1 - Data Collection Procedure and Competence

PG1.23 Provide details about what you are asking participants in this group to do or what is to be done to them. Include a step-by-step description of what participants will experience if they choose to take part in this project. *

The questions to be asked will be the following:
1. What are IM systems currently used in the project management sector in the context of building and construction projects in Australia?
2. What would be the key attributes of a PMIM system for such projects?
3. What would a framework for a PMIM system for such projects look like?

PG1.24 How much time are you asking of participants in this group and when will this time be required? *(E.g., 30 minutes after class).* *

15 - 30 mines

PG1.25 Where will the data be collected (venue and geographical location)? *(e.g., front of 'venue')* *

Selected PMs in Brisbane

PG1.26 Does the research involve the administration of any tests or procedures that require qualifications? *

○Yes◉No

PG1.27 Does the research involve measures or procedures that are **diagnostic** or **indicative** of any **medical** or **clinical** condition, or any other situation of concern? *(E.g., anaemia, bulimia, anorexia, anxiety, suicidal tendencies, aggressive behaviours, etc.)* *

○Yes◉No

Review outcome comments for ***G1 - Data Collection Procedure and Competence***.

This question is not answered.

Click the green arrow to go to the next page.

G1 - Consent Method

PG1.28 Are these participants able to consent for themselves? *

◉Yes○No

PG1.29 Will you use a written Participant Information Sheet or Explanatory Statement to inform participants about this project? *

◉Yes○No

PG1.30 Will these participants be fully informed about the true nature of the research? *

◉Yes○No

PG1.31 Outline how you will gauge that consent to participate has been implied by this group of participants. *

- ○ Implied consent
- ◉ Consent form (must be attached with this application)
- ○ Opt-out consent
- ○ Other

Consent may be expressed in several ways. **A signed consent form** has traditionally been the accepted method of documenting a participant's consent to participate in a research project. Where used, information about the research project is generally presented in a participant information sheet, explanatory statement, or similar document that a participant retains.

The process of communicating information to participants and seeking their consent should not be merely a matter of satisfying a formal requirement. The aim is mutual understanding between researchers and participants. This aim requires an opportunity for participants to ask questions and to discuss the information and their decisions with others if they wish.

PG1.31.2 Outline the process by which the participants will give consent and how they return the consent form to the researchers. *

Forms will be sent to them. Attached is the sample form

Review outcome comments for ***G1 - Consent Method***.

This question is not answered.

Click the green arrow to go to the next page.

Group 2 - Participant Recruitment and/or Observation

G2 - Participant Overview

PG2.1 Participant group 2 working title. *(e.g., student focus group; teacher survey)* *

Project managers - focus group

PG2.2 How many participants are expected to be recruited in this group? *

10.00

PG2.3 Describe who the participants in this group are. *

Project managers

PG2.4 Where will this group of participants be recruited from? *

Australian Institute of Project Managers

PG2.5 Are the participants in this group likely to be under 18 years of age? *

○Yes◉No

PG2.6 Is there a pre-existing (unequal) relationship between the participants, and anyone involved in recruiting and/or collecting data from this group of participants? *(E.g., teachers and/or lecturers/students, doctors/patients, employers/employees, etc.)* *

○Yes◉No

PG2.7 Do these participants have any cultural needs? *(e.g., specific consent arrangements or sensitivities, etc.)* *

○Yes◉No

Review outcome comments for ***G2 - Participant Overview***.

This question is not answered.

Click the green arrow to go to the next page.

G2 - Recruitment Method

PG2.8 Do you have any criteria for the selection, inclusion, or exclusion of participants for this group to take part in the research? *(e.g., minimum age requirements)* *

◉Yes○No

PG2.8.1 Describe the criteria for selection, inclusion or exclusion and outline why you require this for your research design. *

Project managers from within Australia

PG2.9 Indicate which method/s you will use to recruit these participants: *

- ☑ Email
- ☐ Personal contacts
- ☑ Telephone
- ☐ Advertisement
- ☐ Mail out
- ☐ Snowballing
- ☐ Participants from another study
- ☐ Participants approached in person by research team
- ☐ Participants will NOT be actively recruited - they will be observed without their knowledge

☐ Other

PG2.10 Indicate how you will obtain the contact details of these participants. *

☐ From the participants themselves
☐ From a public domain source
☑ From a private or third-party source
☐ Other

PG2.10.1 Provide details about this source and its terms of use. *Please note that obtaining identifiable personal information without consent may constitute a breach of Queensland and Australia privacy legislation.* *

Australian Institute of Project Managers Group, provides a platform for project managers to interact, permission will be sought from individual participants.

PG2.11 Explain who will invite these participants to be involved in this project. *

AIPM Group discussion invitation, through the research team

PG2.12 Will you be offering payment or any other incentives to this group of participants? *

○Yes◉No

Review outcome comments for ***G2 - Recruitment Method***.

This question is not answered.

Click the green arrow to go to the next page.

G2 - Data Collection Methods

PG2.13 Will you collect data via questionnaires / surveys? *

○Yes◉No

PG2.14 Will you collect data via interviews or focus groups? *

◉Yes○No

PG2.14.1 Provide further detail about the **interviews or focus groups**, including: how many sessions will be held; where and at approximately what time (or timeframe) will the sessions be held; who will be present from the research team; how many participants will be present at each session; who will conduct or facilitate the session; will there be a debriefing process (and if yes, what will this involve)?

Attach a copy of your interview or focus group questions (if known) or broad topics in the document upload section. *

Data collection will be through focus groups. The duration of the focus groups will.be about 30minutes - 1 hour. It will be held via Zoom. The researcher will facilitate the focus groups. 8- 12 participants per focus group.
questions are the same as the interview questions

PG2.14.2 Will your interview or focus group session be audio or video recorded? *

◉Yes○No

PG2.14.3 Will you arrange for transcription of the audio or video recording? *

◉Yes○No

PG2.14.3.1 Provide detail on how you will handle the transcription process of the audio or video recording, including who will be involved in transcribing the data, whether the participants will be provided an opportunity to review and/or edit the transcribed document, and how you will safely manage the data transfer process. *

The research team will be completing the focus group transcriptions. Participants will not be provided with the opportunity to review the transcripts.

PG2.15 Will you collect data via observation? *

○Yes◉No

PG2.16 Will you collect data via photography / videography? *

○Yes◉No

PG2.17 Will you collect data via psychological inventories or any other published, standardised test? *

○Yes◉No

PG2.18 Will you collect data via collection of human bio specimens? *

○Yes◉No

PG2.19 Will you collect data via responses to tasks, stimuli, or simulations? *

○Yes◉No

PG2.20 Will you collect data via administration of a substance? *

○Yes◉No

PG2.21 Will you collect data via any other procedure not outlined above? *

○Yes◉No

Review outcome comments for ***G2 - Data Collection Methods.***

This question is not answered.

Click the green arrow to go to the next page.

G2 - Data Collection Procedure and Competence

PG2.23 Provide details about what you are asking participants in this group to do or what is to be done to them. Include a step-by-step description of what participants will experience if they choose to take part in this project. *

1. Participants will be invited to participate in the focus group
2. If participants wish to participate, they will return the consent form via email.
3. Focus group will be set up and Zoom link will be shared with participants.

PG2.24 How much time are you asking of participants in this group and when will this time be required? *(E.g., 30 minutes after class).* *

30minutes - 1 hour

PG2.25 Where will the data be collected (venue and geographical location)? (e.g., front of 'venue') *

Via Zoom.
No sensitive information will be discussed.

PG2.26 Does the research involve the administration of any tests or procedures that require qualifications? *

○Yes◉No

PG2.27 Does the research involve measures or procedures that are **diagnostic** or **indicative** of any **medical** or **clinical** condition, or any other situation of concern? *(E.g., anaemia, bulimia, anorexia, anxiety, suicidal tendencies, aggressive behaviours, etc.)* *

○Yes◉No

Review outcome comments for ***G2 - Data Collection Procedure and Competence***.

This question is not answered.

Click the green arrow to go to the next page.

G2 - Consent Method

PG2.28 Are these participants able to consent for themselves? *

◉Yes○No

PG2.29 Will you use a written Participant Information Sheet or Explanatory Statement to inform participants about this project? *

◉Yes○No

PG2.30 Will these participants be fully informed about the true nature of the research? *

◉Yes○No

PG2.31 Outline how you will gauge that consent to participate has been implied by this group of participants. *

- ○ Implied consent
- ◉ Consent form (must be attached with this application)
- ○ Opt-out consent
- ○ Other

Consent may be expressed in several ways. **A signed consent form** has traditionally been the accepted method of documenting a participant's consent to participate in a research project. Where used, information about the research project is generally presented in a participant information sheet, explanatory statement, or similar document that a participant retains.

The process of communicating information to participants and seeking their consent should not be merely a matter of satisfying a formal requirement. The aim is mutual understanding between researchers and participants. This aim requires an opportunity for participants to ask questions and to discuss the information and their decisions with others if they wish.

PG2.31.2 Outline the process by which the participants will give consent and how they return the consent form to the researchers. *

Participants will be provided with a PIS and can ask questions before submitting a signed consent form. Participants can withdraw, however, once they have participated in focus group, they will be unable to withdraw data.

Review outcome comments for ***G2 - Consent Method***.

This question is not answered.

Click the green arrow to go to the next page.

Supporting Documentation

Supporting Documents

Please arrange to have your ethics application peer reviewed prior to submission. The USQ Peer Review Checklist is available from the Research Integrity website.

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Below is a list of documents that may be required with this application. Upload each applicable item against the matching document name. If you require more than one document to be uploaded per item, please use the 'Add New Document' button (for further assistance please click the item help icon).

****Note**** there are multiple pages in the grid below, use the change page buttons at the bottom of the grid to browse each page.

Allowable file extensions are pdf, doc, docx, xls, xlsx, msg, jpg, ppt, pptx.

Description	Reference	Sof
Participant Information Sheet and/or Explanatory Statement (as required, for each participant group)	Information Sheet (Consent).docx	✓
Consent form (as required, for each participant group)	Consent form (1) revised.docx	✓
Copy of questions (or sample) - for collecting data via interviews/focus groups	Research Questions.docx	✓
consent forms focus group	Consent form (1) focus group.docx	✓
Focus Group Consent Form	Consent form (1) revised (1).docx	✓
Focus Group Information Sheet	Information Sheet (Consent) Focus group.docx	✓
PIS - focus group	Information Sheet (focus group).docx	✓

Review outcome comments for ***Documents*** (1).

This question is not answered.

Review outcome comments for ***Documents*** (2).

This question is not answered.

Review outcome comments for ***Documents*** (3).

This question is not answered.

Review outcome comments for ***Documents*** (4).

This question is not answered.

Review outcome comments for ***Documents*** (5).

This question is not answered.

Click the green arrow to go to the next page.

Declaration

Declaration

USQ Principal Investigator Declaration

I the undersigned declare that I:

- have considered engaging with the peer review of this ethics application, in accordance with the USQ Statement on Peer Review;
- accept ultimate responsibility for the ethical conduct of this research project in accordance with the principles outlined in USQ's Research Code of Conduct Policy, the Australian Code for the Responsible Conduct of Research (2007), and the National Statement on Ethical Conduct in Human Research (2007);
- Have ensured that all people involved in this research project understand and accept their roles and responsibilities.
- Undertake to conduct this research project in accordance with the protocols and procedures outlined in the proposal as approved by USQ's Human Research Ethics Committee (USQ HREC).
- Inform the USQ HREC of any changes to the protocol after the approval of the Committee has been obtained using the USQ HREC Amendment Application procedure AND inform all people involved in this research project of the amended protocol.
- have read and agree to comply with USQ's Research Data Management Policy and pursuant policies and procedures and have a plan for managing and/or sharing Research Data securely; and
- Understand and agree that project files, documents, research records, and data may be subject to inspection by USQ HREC, a research integrity officer, the sponsor or an independent body for auditing and monitoring purposes.

18 USQ Principal Investigator Declaration

1	Full Name	Mr Agrippa Chifeya
	Position	Principal Investigator
	Declaration signed?	Yes
	Signoff Date	12/03/2019

8.5 Consent form

UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

rsity of Southern Queensland

Consent Form for USQ Research Project Interview

Project title: Proposal for a project management information modelling system for building and construction projects.
Human Ethics Approval Number:

Principal Investigator Details
Mr. Agrippa Chifeya
Email: 0096569@umail.usq.edu.au
Mobile: 0426270522
Other investigators
David Thorpe
Email David.Thorpe@usq.edu.au

Statement of Consent

By signing below, you are indicating that you:

- Have read and understood the information document regarding your participation in this project.
- You have had any questions answered to your satisfaction.
- Understand that if you have any additional questions you can contact the research team.
- Understand that the interview will be audio / video recorded.
- Understand that you are free to withdraw at any time, without comment or penalty.
- Understand that you can contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au if you do have any concern or complaint about the ethical conduct of this project.
- Agree to participate in the project.

- Are over 18 years of age?

Name	
Signature	
Date	

8.6 Information Sheet

Project title: Proposal for a project management information modelling system for building and construction projects.

University of Southern Queensland

Information Sheet

Principal Investigator Details
Mr. Agrippa Chifeya
Email: 0096569@umail.usq.edu.au
Mobile: 0426270522

Description

This project is being undertaken as part of a Doctoral Research Project.

The purpose of this project is to investigate an evolving disruption in the construction and building sectors from the seeming slow uptake of information modelling (IM) systems in project management practices. IM systems currently assist in the design and construction phases of building and construction projects and help to create a combined process involving the project team, owners, contractors, and designers during those phases. Existing modelling systems include Building Information Modelling (BIM), Building Environment Modelling (BEM), Building Energy and Environment Modelling (BEEM) and Building Performance Modelling (BPM)
The research team requests your assistance because I need to determine if a project management IM system (PMIMS) can be developed to provide better project outcomes in the context of building and construction projects in Australia, and if so, what would be the key attributes of such a system.

Participation

Your participation will involve participation in an interview that will take approximately 20 minutes of your time.

The interview will take place at a time and venue that is convenient to you.
OR
The interview will be undertaken by teleconference at a date and time that is convenient to you.

Questions will include:

1. What IM systems are currently being used in the project management sector in the context of building and construction projects in Australia?
2. What would be the key attributes of a PMIMS system for such projects?
3. What would a framework for a PMIMS system for such projects look like?

The interview will be audio recorded.

Your participation in this project is entirely voluntary. If you do not wish to take part, you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. You may also request that any data collected about you be destroyed. If you do wish to withdraw from this project or withdraw data collected about you, please contact the Research Team (contact details at the top of this form).

Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland.

Expected Benefits

It is expected that this project will directly benefit you, as findings will be sent to you.]. However, it may benefit the project management and construction sector in Australia.

Risks

There are no anticipated risks beyond normal day-to-day living associated with your participation in this project.

Sometimes thinking about the sorts of issues raised in the interview can create some uncomfortable or distressing feelings. If you need to talk to someone about this immediately please contact Lifeline on 13 11 14. You may also wish to consider consulting your General Practitioner (GP) for additional support.

Privacy and Confidentiality

All comments and responses will be treated confidentially unless required by law. You will be given a chance to verify if need be, your comments. All recordings will be used as an instructional aide only and will be destroyed after 5 years.
Any data collected as a part of this project will be stored securely as per University of Southern Queensland's Research Data Management policy.

Consent to Participate

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate in this project. Please return your signed consent form to a member of the Research Team prior to participating in your interview.

Questions or Further Information about the Project

Please refer to the Research Team Contact Details at the top of the form to have any questions answered or to request further information about this project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project you may contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au. The Ethics Coordinator is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Thank you for taking the time to help with this research project. Please keep this sheet for your information

8.7 Coding summary by file

6/03/2019 11:07 PM

Coding Summary By File

Final Project 1

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On

Document

Files\\Interviews\\INTERVIEW 7

Node

Nodes\\project 3\How do these information modelling systems collaborate with other stake holders~

	Yes	0.0791	8			
				1	AC	16/03/2019 7:57 PM

How do these information modelling systems collaborate with other stake holders?
You can use custom fields in stakeholder communication; for instance, you can make sure no work is lost, and by searching and transmitting an incomplete task that might be of priority. One can also save reports for quick access anytime; the report will automatically update as work progresses. ASANA is great with tools you are already using like Salesforce slack g suite and much more plus.

Nodes\\project 3\How long have you used information modelling systems~

	Yes	0.0287	8			
				1	AC	16/03/2019 7:57 PM

How long have you used information modelling systems?
I can say we have been using this information modelling system since 2015 and since that time we have not changed.

Nodes\\project 3\How useful are these information modelling systems if any in your everyday project delivery~

	Yes	0.0474	8			
				1	AC	16/03/2019 7:57 PM

How useful are these information modelling systems if any in your everyday project delivery?
ASANA is very useful, like if you want to lock down the editing access you can create a comment on teams as people work in different projects. We use it every day and we find it useful.

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On

Nodes\\project 3\What information modelling system currently used in project management sector in the context of building and construction projects in Australia~

	Yes	0.3223	8			
				1	AC	16/03/2019 7:57 PM

What information modelling system currently used in project management sector in the context of building and construction projects in Australia?
ASANA is a IMs that we use at our company. To find our company's teams in projects, and teams like marketing design, and Human Resources Asana makes it very easy. Asana can be used to run an entire organization making it easy for all teams to better collaborate amongst themselves and with each other. The whole conversation calendars in projects gives one a bird’s eye view of everything relating to projects. With this IMs, you can also see a couple of examples of custom fields with columns for contents page, you can create drop down text or numeric fields to track anything from task priority to marketing a channel to the application fill & beyond— you can sort by customer fields With ASANA, there is even more tabs to see your work organized in the way that works best for you and the additional part of your tabs let you access all the product information you need to use in conversations instead of an email chain to communicate with products they called it; you can at mention the relevant test. So, everyone can easily see the details of the work you did. Additionally, you can also create new conversations directly through email; it's like a Google group or Facebook group for Work Calendar which shows all of your test date ranges in lines making it easier to schedule work and have a clear sense of your project timeline, promiscuity post status updates with red, yellow and green indicators. You can sporadically find out how close your team is to achieving its goals and keep managers and executives in the loop without all the time-consuming update meetings and finally, there's a file view showing every attachment and a gallery view so you don't have to dig through folders or email to find the files you're looking for. ASANA is good for us as a project team.

Nodes\\project 3\What shortfalls are you experiencing and what do you think done will be the future problems with the current

	Yes	0.0886	8			
				1	AC	16/03/2019 7:57 PM

What shortfalls are you experiencing and what do you think done will be the future problems with the current?
Yes, one of the disadvantages of this information system is when it is down especially when it comes to payments and collaborating with software and workspaces within the project. One of the biggest challenges for you too but otherwise when you're doing the lack of any workarounds and there are project extensions, and when you want to try to do anything about it outside software like maybe importing exporting.

Nodes\\project 3\What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents

	Yes	0.1118	8			
				1	AC	16/03/2019 7:57 PM

What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents?
I would probably propose a project management information System that is easy for our project managers. I think if someone can come up with any information modelling system, or if you are given a chance to point out what we have or how it would look \, I think you could look

at any information. That I think we should look if there are any current in project management information systems if they are there, like Building Information modelling system would be good but being tailor made for project management.

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On

Nodes\\project 3\What would be key attributes qualities if the proposed project management information modelling system for such projects would you want

	Yes	0.1245	8			
				1	AC	16/03/2019 7:57 PM

What would be key attributes qualities if the proposed project management information modelling system for such projects would you want?
It is quite difficult to explain elaborately on how the proposed Project Information system would be of value without seeing anything. It is probably better if you could come with it with something that one could look at. Probably it will be great, however, as of now, we have a big problem especially in terms of being able to complete everything with the one project management software. You find that one of its main strengths is 10 emails; in the monetary issues it's not really more to do with project management; yes, we use it is but in terms of the pure project management it’s not really compatible.

Nodes\\project 3\Would such elements improve project delivery in terms of communications of stake holders

	Yes	0.0744	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of communications of stake holders?
I think yes, these elements would definitely improve communication with stake holders; this would definitely improve communication between stake holders because it automatically improves delivery time delivery in terms of communication and delivery as a whole that would definitely improve since communication is the key to the project— it would be good.

Nodes\\project 3\Would such elements improve project delivery in terms of time, cost, and quality

	Yes	0.1140	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of time, cost, and quality?
Most of the time in project management where you lose money is why you cannot couple this three things, time, cost, and quality. If these things are not coupled properly a client will definitely lose money, and that's where you find that project managers will start abandoning a project and are going somewhere in hideouts or something without seeing where they’re going— it's because of the time.
and quality. If anything, that has to do with the improvement in the project management information modelling fraternity, then that means that the cost in quality will be more enhanced.

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On

Files\\Interviews\\INTERVIEW 1

Node

Nodes\\project 3\How do these information modelling systems collaborate with other stake holders~

	Yes	0.0756	8			
				1	AC	16/03/2019 7:57 PM

How do these information modelling systems collaborate with other stake holders?
Well like I said, these information modelling systems are not very user-friendly; when we do collaboration with other project stake holders, we would use other software like BIM or other project management information systems. We would use something else because Accelo cannot do much collaboration with other stake holders, that is why we choose to use other information modelling systems to do collaboration and communicate with other stake holders.

Nodes\\project 3\How long have you used information modelling systems~

	Yes	0.0460	8			
				1	AC	16/03/2019 7:57 PM

How long have you used information modelling systems?
Well, I can say we have been using these information modelling systems since 2013 and since that time we have not transformed, we have always been using these information modelling systems, the Accelo like I told you it has been handy from 2013-2018— it's about 5 years

Nodes\\project 3\How useful are these information modelling systems, if any, in your everyday project delivery~

	Yes	0.1452	8			
				1	AC	16/03/2019 7:57 PM

How useful are these information modelling systems, if any, in your everyday project delivery?
Well, they are very useful because you essentially cannot run a project without an information modelling system; you cannot do much without one information modelling system. That's why for every project that we run we use at least one of the information modelling systems of some sort and if we don't do that, we would have project delays, paperwork accretion because we would not be using any one information modelling system therefore, they are very important and very useful. But like I said, this one information modelling system we use sometimes for other things and some for the other like this Accelo, we use it for planning. Accelo is very handy for planning, but when looking at information sharing, or information transfer we find out it is not very useful; that is when we change to BIM. That is what I can say for now; they are very useful but, in some way, they are not as useful as one would want it to be. Thank you

Nodes\\project 3\What element would you want in such a PMIMS

	Yes	0.0456	8			
				1	AC	16/03/2019 7:57 PM

What element would you want in such a PMIMS?
Well, the elements I told you before, exclusively the element of planning and to be able to interact with project stakeholders and to be able to communicate with other team members. Those major elements we would need in such a project management information modelling system.

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On

Nodes\\project 3\What information modelling system is currently used in project management sectors in the context of building and construction projects in Australia~

	Yes	0.2308	8			
				1	AC	16/03/2019 7:57 PM

What information modelling system is currently used in project management sectors in the context of building and construction projects in Australia?
Well, there are more than one information modelling system which I use and one of them is called Accelo. With Accelo, we use it in our company and Accelo was custom- made for our company. Accelo works in alliance with Building Information Modelling Systems (BIM) however, there are things that Accelo cannot do that BIM can do. I can say this is one of the information modelling systems that is used in project management and this Accelo, we have used it habitually in building and construction projects all around Australia. This platform is automated and rationalizes work into one integrated system with Excel client accounts, project timesheets and projects are tracked for you so you can spend less time and meetings and dealing with admin work. Accelo provides answers to important questions instantly giving your insight so you can track as well as it helps to make decisions with confidence by streamlining your operations; you will be free to dedicate your full attention to your client. This technology platform that makes you and your team more productive, profitable, and confident. Long time ago, we used to use just Excel, it was useful, but we didn't need to use it in most of the projects since it was imperfect, and we only used it for small projects and construction and project management, as the company grew; that is when we thought of customising our own Accelo and moving away from Excel - and that's all I can say about one information modelling system.

Nodes\\project 3\What shortfalls are you experiencing and what do you think will be the future problems with the current IMs

	Yes	0.0800	8			
				1	AC	16/03/2019 7:57 PM

What shortfalls are you experiencing and what do you think will be the future problems with the current IMs?
Yes, like I told you before we are having problems with the information modelling systems we are using now in a way because we need to switch from one to the other and during that process, we are prone to lose some information, also another software might not fully interpret what you have told the other and this sometimes affects our management information modelling system from the start to the end of the project management of the project life cycle.

Nodes\\project 3\What would a framework structure of a PIM (Project Management information modelling system) for such projects look like for their background contents

	Yes	0.1027	8

1	AC	16/03/2019 7:57 PM

What would a framework structure of a PIM (Project Management information modelling system) for such projects look like for their background contents?
Well, I'm not sure what you mean in terms of background and contents, but I will try to answer it as much as I can; in terms of background, I think it would just be anything that has project information that has happened before like the history of the project; those are the minor things needed in the project. Since communication is the key, we needed to have interaction with other people in terms of sending emails ascribing information; things like probably something there and some things that are out of this world like the visual aids or something like that Thank you

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On

Nodes\\project 3\What would be the key attributes and qualities of the proposed project management information modelling system for such projects~ What would you want

	Yes	0.0991	8

1	AC	16/03/2019 7:57 PM

What would be the key attributes and qualities of the proposed project management information modelling system for such projects? What would you want?
Well like I said before if there were a project management information modelling system that would cater from initiation until the end of the project life cycle that would really help. The major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is done promptly making sure there is a clear communication channel between stake holders and a way of doing things that simplify an information modelling system, not a complicated one, that is user friendly that anyone can use.

Nodes\\project 3\Would such elements improve project delivery in terms of communications of stake holders

	Yes	0.0602	8

1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of communications of stake holders?
I think I answered this one before; yes, these elements would definitely improve communication between stake holders because it automatically improves delivery time delivery in terms of communication, and delivery as a whole; that would definitely improve the delivery since communication is the key to the project—it would be good.

Nodes\\project 3\Would such elements improve project delivery in terms of time, cost, and quality

	Yes	0.1069	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of time, cost, and quality?
Yes, these elements would improve the project delivery in terms of time, cost, and quality because every project is anchored on time cost and quality so these are the things that would be making sure should be achieved. Also, if this project management information modelling system that you are proposing, it would cut on our time and cost. This means that I would now be using less time to transfer from one program to another and that would help me especially if I want to track time for my costing of the project and even the quality of the project. Yes, these elements would improve on the delivery in terms of cost, time, and quality.

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded by Initials	Modified On

Files\\Interviews\\INTERVIEW 2

Node

Nodes\\project 3\How do these information modelling systems collaborate with other stake holders~

	Yes	0.1248	8			
				1	AC	16/03/2019 7:57 PM

How do these information modelling systems collaborate with other stake holders?
In terms of collaboration with other stakeholders this is where a new information Modelling system would probably come in because right now the communication is a bit tricky when it comes to communicating with other project stakeholders; for example, when we have a meeting. When you want to conduct a meeting, it is just a fight, it will be difficult to be able to talk to everybody at one go. You would probably need to send emails to each person which would be very cumbersome and would be very difficult especially when you are dealing with their project.

I remember there was one project that we did— it was a $15 million project and that was way back in I think 2008/2009 around about, it was so difficult, very difficult to be able to communicate with other people and be able to communicate in terms of the communication. Well like I said, these information modelling systems are not very user friendly and when we do collaboration with other project stake holders, we would use other software like BIM or project management information systems; we would probably use something else because IPQ cannot do much in the way of collaboration with other stake holders; that is why we choose to use other information modelling systems to do collaboration and communicate with other stake holders

Nodes\\project 3\How long have you used information modelling systems~

	Yes	0.0895	8

1	AC	16/03/2019 7:57 PM

How long have you used information modelling systems?
Although information modelling systems have been in existence for a long time, I can say in our company we migrated from the use of Paper project management into information modelling systems some time back, in 2003 I think it was that we migrated from paper to information modelling systems. Well in the beginning we cannot really say it was a project management without that information. Modelling systems, we could do yes, we could use things like Excel, also we could use things like Word, but it was in the olden days— just a few people were able to use computers and yeah everybody else could be able to understand if people don't even have the plans were also in papers. Well, I can say we have been using these information modelling systems since 2013 and since that time we have not changed; we have always been using these information modelling systems; the IPQ like I told you— it has been handy from 2013-2018, it's about 5 years

Nodes\\project 3\How useful are these information modelling systems if any in your everyday project delivery~

	Yes	0.1487	8

1	AC	16/03/2019 7:57 PM

How useful are these information modelling systems if any in your everyday project delivery?

Without project management information modelling systems there is virtually nothing you can do in project management, that is why it is important to continue to use information modelling systems. Without that you can run any project and think you have succeeded but all that you need and want is information modelling systems. Without them surely you will fail, that is why, from our discussion just before the interview, is that we need something that can work on that can be done in order to come up with something that is reasonable, to be able to satisfy our needs in project management. This will surely help a lot in their delivery of project management in every sector and in every field of project management. Well, they are very useful because you actually cannot run a project without this one information modelling system; you cannot do much without one and that's why for every project that we run we include at least one of the information modelling systems of some sort; and if we don't do that, we would have project delays, and paperwork accumulation therefore they are very important and very useful. But like I said, this one information modelling system we use, sometimes for one thing and sometimes for other things, like this IPQ, we use it for planning— it is very handy for planning but when looking at information sharing, or information transfer we find out it is not very useful; that is when we change to BIM. That is what I can say for now. They are very useful but, in some way, they are not as useful as one would want them to be.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

Nodes\\project 3\What element would you want a such a PMIMS

	Yes	0.0573	8

1	AC	16/03/2019 7:57 PM

What element would you want a PMIMS?
Well I think this is just a replication of the last question but yeah the elements that we need maybe in the project management information systems that I just said about communication, like being able to collaborate with other stakeholders, yeah just a few things not much just if you're posting that's what you need to take much more easier to be able to work with; not much effort and yeah that would be good for us, also the element of planning from initiation to demolition, and to being able to interact with project stake holders and to be able to communicate with other team members.

Nodes\\project 3\What information modelling system currently used in project management sector in the context of building and construction projects in Australia~

	Yes	0.1206	8

1	AC	16/03/2019 7:57 PM

What information modelling system currently used in project management sector in the context of building and construction projects in Australia?
To be frank with you there are so many modelling systems that are currently used in project management, however we've got just a few that we use at our company so I'm going to just tell you about this one called IPQ. Although IPQ is not as good as other IMs, I can say this is one of the information modelling systems that is used in project management in building and construction projects all around Australia. A long time ago we used to use just Excel; it was useful, but we did not need to use it in most of the projects since it was limited. IPQ was started by a certain man called in Teko Tuna, one of the project management gurus. This man was from Iraq and he discovered that he could do better with an IPQ than the then IMs, so he started working with IPQ. IPQ was custom made for our company and this IPQ works in collaboration with Building Information Modelling Systems (BIM) however, there are things that IPQ cannot do that BIM can do. We also only used it on small projects and construction and project management as the company grew; that is when we thought of customising our own IPQ and moving away from Excel and that's all I can say about one information modelling system.

Nodes\\project 3\What shortfalls are you experiencing and what do you think done will be the future problems with the current …

	Yes	0.1277	8

1	AC	16/03/2019 7:57 PM

What shortfalls are you experiencing and what do you think done will be the future problems with the current …
Now I can see there are just a few shortfalls that you are facing but one of the biggest shortfalls is not being able to complete everything in one go. I'll give you an example: if you want to make a project life cycle from the beginning to the end it's difficult with this Ims: we will probably need something that is going to be helpful and which is going to be able to run from initiation until demolition, and be able to talk to other project managers and communicate with all the stakeholders; and be able to talk in a language that everyone else will understand, then probably that would help especially to be able to address future problems and come up with a solution. Also like I told you before we are having problems with the information modelling systems we are using now in a way, because we need to switch from this one to that one and during the way we might lose some information. Another software might not fully interpret what you have told the other software surely, we are having problems with that and we need for that to be ratified as soon as possible. I think someone should help us with that because all we need is a wholesome project management information modelling system that can help us from the start to the end of the project management of the project life cycle.

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On

Nodes\\project 3\What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents

	Yes	0.0452	8			
				1	AC	16/03/2019 7:57 PM

What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents?
Well, I am not sure what you mean in terms of background and contents, but I will try to answer it as much as I can in terms of background. I think it would just be anything that has project information that has happened before like the history of the project and other things needed in the project like communication, as it is the key. Thank you.

Nodes\\project 3\What would be key attributes qualities if the proposed project management information modelling system for such projects would you want

	Yes	0.1353	8			
				1	AC	16/03/2019 7:57 PM

What would be key attributes/qualities if the proposed project management information modelling system for such projects would you want?
There are people like PMBOk, which they tried by every means to put together what a project management would look like, in what characteristics of a project life cycle and other project phases of the project lifecycle management. Although it is not the best that people need now, it is something. I am trying to explain this the best I can about the actual IMs. With the management book (PMBOk) we see they have the qualities that they've tried to put together like the qualities of a good IMs, but they don't really give us what we need; they don't really put together all that is needed for an information modelling system especially when it comes to communication, especially when it comes to things like communicating with customers. But like I said before if there is there is a project management information modelling system that would cater from initiation until the end of the project life cycle that would really help us; so the major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is done promptly making sure visual aids that are included, making sure there is a clear communication channel between stake holders and the client and a way of doing things that simple an information modelling system, not a complicated one, that is user friendly that anyone can use.

Nodes\\project 3\Would such elements improve project delivery in terms of communications of stake holders

	Yes	0.0489	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of communications of stake holders?
Good elements will improve project delivery. Communication is the key for project management. If communication is not good during the project then everything else will go hey-wire that's why it is important to make sure that you have enough resources, you have good systems, and you have enough tools; you have enough of everything in IM and that will make your life easy especially in terms of communication. Oh, the project delivery, yeah, I think so.

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On

Nodes\\project 3\Would such elements improve project delivery in terms of time, cost, and quality

	Yes	0.0974	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of time, cost, and quality?
Everybody knows that your project management is about time cost and quality. If those things are not met then there is no good project, then everybody else agonizes from the client and until the project manager. You'll find that sometimes you will be trying to manage a project well then you'll see some project being up and only having troubles and having some arguments at sites being attributed by the delays from the inefficient IMs, however if time, cost and quality are able to be harnessed from the beginning through the use of correct and efficient IMs, then that will be alright and that means we should be able to improve cost time and quality of project that we do. Correspondingly, by improving on our time and cost we would now be using less time to transfer from one program to another and that would help us especially if you want to track your time and costing of the project, and even the quality. Yes, these elements would improve on the delivery in terms of cost, time, and quality.

Files\\Interviews\\INTERVIEW 3

Node

Nodes\\project 3\How do these information modelling systems collaborate with other stake holders~

	Yes	0.1103	8			
				1	AC	16/03/2019 7:57 PM

How do these information modelling systems collaborate with other stake holders?
Well like I told you there are pros and cons in using this software and one of the things is the collaboration yet to be called to be able to collaborate between the customers and other stakeholders, people like people to be able to communicate but it's not easy. One of the things that I wanted to point out is that you would be able to collaborate with the sub-contractors and the other people that we deal with on a day-to-day basis but yeah, we've tried to talk to the support team since I bought this software but looks like we are not going nowhere.

Nodes\\project 3\How long have you used information modelling systems~

	Yes	0.0846	8			
				1	AC	16/03/2019 7:57 PM

How long have you used information modelling systems?
In this company with this one, this information system I have been using it for about 2 years now and we have been talking to management review about this information modelling system. When you are you in the company you can't ask a lot, you can't request for a lot of changes yeah just be looking at you and well not knowing where you are coming from and what are you at, your question would come up with probably something much better.

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded By Initials	Modified On

Nodes\\project 3\How useful are these information modelling systems if any in your everyday project delivery~

	Yes	0.1152	8			
				1	AC	16/03/2019 7:57 PM

How useful are these information modelling systems if any in your everyday project delivery?
Like I said before Maven link is a software for project management solutions, resource planning and things like that but the expediency of it every moment is a bit tricky even though it is you undertaking the job; it is the one that we're using on a day-to-day basis, that is cost management, time in planning, all the sort of things. To be analytic yeah it is that it just works on one project design per time, and in terms of navigation, it doesn't really have many tabs, I like navigation but just limited yeah so yeah, it's alright yeah alright, that's alright for now.

Nodes\\project 3\What element would you want a such a PMIMS

	Yes	0.0307	8			
				1	AC	16/03/2019 7:57 PM

What element would you want a such a PMIMS?
It is mostly difficult to spell out what you are trying to out here, but I will try to answer in the best way that you think is right.

Nodes\\project 3\What information modelling system currently used in project management sector in the context of building and construction projects in Australia~

	Yes	0.1786	8			
				1	AC	16/03/2019 7:57 PM

What information modelling system currently used in project management sector in the context of building and construction projects in Australia?
In our company we use the software that is called Maven link software. This is a solution given for Project Management resource planning and things like even final finance management. It also deals with things like time planning, Cost planning. It is designed mostly to be used by businesses and to easily collaborate with the project managers and to use all the project management tools— yeah that is what we use at our company. It’s good for export compatibility especially when it comes to things like scheduling and it works with programs like QuickBooks, you know when you are using QuickBooks it's easy to collaborate with project management but yeah that's what we can do you just have to use that yeah that's what the company can provide, then now you can't do anything when the company says use this year, even though I think there could be better things out there in the market.

Nodes\\project 3\What shortfalls you are experiencing and what you think done will be the future problems with the current.

	Yes	0.0983	8			
				1	AC	16/03/2019 7:57 PM

What shortfalls you are experiencing and what do you think done will be the future problems with the current.
The major short falls that I see that you could face if we continue to use this software are that probably it will cost us is that of losing customers. When you lose customers that is one of the things that no one ever in this world would want, so yeah especially when it comes to delivery yeah that is where my heart beats when it comes to delivery. Without proper delivery of the project you are doomed, you cannot do anything, you may as well go back home.

Classification	Aggregate	Coverage	Number Of Coding References	Reference Number	Coded by Initials	Modified On

Nodes\\project 3\What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents

	Yes	0.1160	8			
				1	AC	16/03/2019 7:57 PM

What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents?
Is very difficult to be able to tell you what type of project management information modelling system, but I think that's your job as students, that's what you get to look at and then you give us what you think and then we can talk about it another day; and then maybe it can tell you why it is what you think. However, I think another project management information system is availed, since you guys are still young and you are still researching on these things, maybe you can be able to come up with something.

Nodes\\project 3\What would be key attributes qualities if the proposed project management information modelling system for such projects would you want

	Yes	0.1191	8			
				1	AC	16/03/2019 7:57 PM

What would be key attributes qualities if the proposed project management information modelling system for such projects would you want?
From my previous answers, I still believe that if there is a project management information modelling system that would cater from initiation until the end of the project life cycle that is until the demolition stages, I would want in such a PMIMS Project management information modelling system, would be making sure the communication is done promptly, making sure there is a clear communication between stake holders and the client as well as a simple information modelling system, not a complicated one that is user friendly and that anyone can use.

Nodes\\project 3\Would such elements improve project delivery in terms of communications of stake holders

	Yes	0.0489	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of communications of stake holders?
Yes, I think communication will be improved when we have another information system; not this one we are using because to be honest with you it is not very useful in terms of project management.

Nodes\\project 3\Would such elements improve project delivery in terms of time, cost, and quality

	Yes	0.0903	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of time, cost, and quality?
For your projects to be able to succeed you know you need to be able to apply all the knowledge skills, all the techniques and all the activities that are needed for the project requirement. Yes, looking at things, like the stakeholders who sometimes have different opinions and to be competing with ever-changing sites, together with the demands of the client, in project management the time, cost and quality would improve project delivery.

16/03/2019 11:07 PM

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

Files\\Interviews\\INTERVIEW 4

Node

Nodes\\project 3\How do these information modelling systems collaborate with other stake holders~

	Yes	0.1038	8			
				1	AC	16/03/2019 7:57 PM

How do these information modelling systems collaborate with other stake holders?
When it comes to things like stakeholder communication and collaboration, some better things could be done especially in terms of collaboration. I do not know how but I can explain this, but if you had a chance I would come and show you what I am talking about. I'm not sure if I am allowed to do that, but if you haven't experienced a lot of different project management tools it will be difficult for you to understand what I'm talking about, but if another maybe one day, if we could find another project management information system it would help us more.

Nodes\\project 3\How long have you used information modelling systems~

	Yes	0.0592	8			
				1	AC	16/03/2019 7:57 PM

How long have you used information modelling systems?
I've used this software for a long time now; I think I've been using it for almost 6 years now and yes there are some things that we thought would be improved but I'm alright for now we just hope that one day a Messiah would come and help us especially in terms of project management information modelling systems.

Nodes\\project 3\How useful are these information modelling systems if any in your everyday project delivery~

	Yes	0.1015	8			
				1	AC	16/03/2019 7:57 PM

How useful are these information modelling systems if any in your everyday project delivery?
Well, I can see having used this management tool for many years it is difficult not to love this software. However, there is something that I feel that can be done— it can be able to put everything together to have one optimal IMs in order to make projects comparatively faster and be able to plan all that you need, and to be able to do things in other software like in Excel. It is difficult to give you scenarios over how difficult or how is it, but it is not too bad, it is alright, it is just a software that can be used here.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

Nodes\\project 3\What information modelling system currently used in project management sector in the context of building and construction projects in Australia~

	Yes	0.2023	8			
				1	AC	16/03/2019 7:57 PM

What information modelling system currently used in project management sector in the context of building and construction projects in Australia?
Project management is ready for a revolution, traditional project planning Solutions rely on people to manually adjust schedules that precedence. Liquid planner is predictive project management software for modern businesses that we use at our company but works in alliance with Building Information Modelling Systems (BIM). This is the project management information modelling system used as software for project management. The world today mostly relies on predictive planning technology, the other thing about liquid planner is that it can be able to give you a better plan. We have about 200 people in our organisation and we sometimes do about 10 projects at a time, it is a good project management software. When you use it, you will be able to focus on work and be able to make data entry in any form in time. However, there's still some pitfalls about it which are some people like us project managers that would want to be addressed so that it can be something that it can be completely relied upon for complete delivery of project management, especially in this kind of construction environment in Australia.

Nodes\\project 3\What shortfalls are you experiencing and what do you think done will be the future problems with the current

	Yes	0.1109	8			
				1	AC	16/03/2019 7:57 PM

What shortfalls are you experiencing and what do you think done will be the future problems with the current?
Like in other software, I think the shortfall that we can talk about now, I could write down for you, maybe if you had given me enough chance, or if I knew what kind of questions you are going to ask, I would have been able to write down for you because there are a lot of our pros and cons. The other shortfall is in transforming from one level of project progress to the other. With another software probably it could have been better. I mean another software that could be able to be used from the origination to the end of the project without collaborating with other software.

Nodes\\project 3\What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents

	Yes	0.0793	8

1	AC	16/03/2019 7:57 PM

What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents?
It will be good to have a project life cycle and product IMs that starts from initiation, planning, project definition, and documentation as well as delivery, and until disposal that will help us a lot if we have such a good information modelling system, because without that it's surely very difficult in terms of our project management.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

Nodes\\project 3\What would be key attributes qualities if the proposed project management information modelling system for such projects would you want

	Yes	0.1002	8

1	AC	16/03/2019 7:57 PM

What would be key attributes qualities if the proposed project management information modelling system for such projects would you want?
As alluded to before, if there were a project management information modelling system that would cater from initiation until the end of the project life cycle that would really help us as project managers. Also, the major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is done punctually making sure visual aids are included making sure there is a flawless communication channel amid stake holders and the client

Nodes\\project 3\Would such elements improve project delivery in terms of communications of stake holders

	Yes	0.1085	8

1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of communications of stake holders?
Surely these elements will improve project delivery, and definitely have a better project management environment and communication like you are asking, about communication and a better information modelling system, definitely what we are experiencing now is not what we would prefer as project managers. I could have answered this one before yes, these elements would definitely improve communication with stake holders, and this would definitely improve communication between stake holders, because it automatically improves delivery time delivery in terms of communication and delivery.

Nodes\\project 3\Would such elements improve project delivery in terms of time, cost, and quality

	Yes	0.1261	8

1 AC 16/03/2019 7:57 PM

Would such elements improve project delivery in terms of time, cost, and quality?
Project management knowing all the areas of property management that is about the integration of project management; how to harness the processes to ensure that all the various elements are met like project scope management, time management, cost and quality management as well as project delivery. Since the successful success of a project is moored to time management, management of the cost of project management and the overall management, better IMs solutions can improve those key elements of project management. So, if all these things are met then all things should be good— you to have a sound project.
Yes, these elements would improve on the delivery in terms of cost time and quality

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

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Node

Nodes\\project 3\How do these information modelling systems collaborate with other stake holders~

	Yes	0.1181	8

1 AC 16/03/2019 7:57 PM

How do these information modelling systems collaborate with other stake holders?
Said before it is very ok to use this IMs, but we have one big challenge with it; one of the biggest challenges is that it is not able to work with a lot of people at once. I will probably say, if the number of people is over 20 or so it is a bit tricky to use. Since we have a small number of about 15 employees in this company, it could work for now. Another issue also is about the multiple chat options and for displaying the timelines for projects. Finally, the most important thing that we would want is to be able to work standing on its own without other players like BIM, yeah that is where the biggest shortfall is and in terms of communicating. Lastly, it is not being able to work from the beginning to the end without encompassing other Information systems.

Nodes\\project 3\How long have you used information modelling systems~

	Yes	0.0441	8

1	AC	16/03/2019 7:57 PM	

How long have you used information modelling systems?
Well, I can say we have been using these information modelling systems since 2013 and since that time we have not changed; we have always been using these information modelling systems; the IPQ like I told you it has been handy from 2013-2018— it's about 5 years

Nodes\\project 3\How useful are these information modelling systems if any in your everyday project delivery~

Yes	0.1242	8	

1	AC	16/03/2019 7:57 PM

How useful are these information modelling systems if any in your everyday project delivery?
Well, they are very useful because you cannot run a project without this one information modelling system; you cannot do much without one information modelling system. Every project that we run, we include at least one of the information modelling systems of some sort and if we do not do that, we have project delays, paperwork accumulation because of that. But like I said this one information modelling system we use some for other things and some for the other like this Wrike, we use it for planning, it is very handy for planning but when looking at information sharing, or information transfer we find out it is not very useful; that is when we engage BIM. That is what I can say for now, they are very useful but, in some way, they are not as useful as one would want it to be. Thank you.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

Nodes\\project 3\What information modelling system currently used in project management sector in the context of building and construction projects in Australia~

Yes	0.1984	8	

1	AC	16/03/2019 7:57 PM

What information modelling system currently used in project management sector in the context of building and construction projects in Australia?
As for the project management my team is responsible for managing projects small and large including new store openings Wrike is right because it gives us the visibility, flexibility, and collaborative tools we need to deliver efficient timely projects. I use Wrike software when the project team is working on a project and look for any requests that come out; your request to help at the new project opening. Do you have time to work on a new project? It is available for you always and anywhere offline. It collaborates on tasks using My Live Editor and sound real time comments, enabling so much communication without breaking down and preventing anyone from getting disabled once offline. It also attaches the latest task posted and asks for feedback using the proofing and approval out on since everyone's commentary box is always active. This reduces confusion and makes the review process quick and easy after all the feedback has been addressed. Once a task is approved, and just like that the first phase of the project it is done for you, and all you need to do is to report to track over our progress allowing us to see any potential issues that might create unnecessary delay be accounted for keeping everyone informed and most importantly delivering a project on time.

Nodes\\project 3\What shortfalls are you experiencing and what do you think done will be the future problems with the current

	Yes	0.1570	8

1 AC 16/03/2019 7:57 PM

What shortfalls are you experiencing and what do you think done will be the future problems with the current?
As I said before it is very ok to use this Ims, but we have one big challenge with it; one of the biggest challenges is that it is not able to work with a lot of people at once. I will probably say, if people are over 20 or so it is a bit tricky to use. Since we have a small number about 15 employees in this company, it could work for now. Another issue also is about the multiple chat options and for displaying the timelines for projects. Finally, the most important thing that we would want is to be able to work standing on its own without other players like BIM, yeah that is where the biggest shortfall is and in terms of communicating. Lastly, it is not being able to work from the beginning to the end without encompassing other Information systems software in between so it's just that's one of the problems that you face in there that I think if someone would be able to collaborate like you're saying all this software to put them in one thing and then becomes another project management information system.

Nodes\\project 3\What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents

	Yes	0.0632	8

1 AC 16/03/2019 7:57 PM

What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents?
It really depends on what you think needs to be done but I think just a project management information modelling system that will enable project managers to function without any Ims hindrances. Especially in terms of the ability to stand independently with support of other systems like BIM or excel.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

Nodes\\project 3\What would be key attributes qualities if the proposed project management information modelling system for such projects would you want

	Yes	0.1010	8

1 AC 16/03/2019 7:57 PM

What would be key attributes qualities if the proposed project management information modelling system for such projects would you want?
One of the things that I want in the new Ims, if you are saying you are going to propose another project management information modelling system is probably of flexibility. I really want the Ims to be able to be flexible especially in terms of navigation, from navigating from one field to another and being able to clearly communicate with stakeholders easily without being caught without being channeled to another software or to another email sending software. Just being able to do everything there and be able to finally to be able to use Just One software in terms of communication.

Nodes\\project 3\Would such elements improve project delivery in terms of communications of stake holders

	Yes	0.0834	8

1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of communications of stake holders?
When you talk about project communications, you will be talking about communication from the planning, right from the beginning planning of the project, Things like information systems can be shared between the project stakeholders and all the other people that are involved in the project. There are things like performance reporting also that improve once there is an improvement in the Ims that one uses. Just to sum up, there will be an improvement in terms of communication with stakeholders.

Nodes\\project 3\Would such elements improve project delivery in terms of time, cost, and quality

	Yes	0.1036	8

1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of time, cost, and quality?
When you ask me about improvement, especially the delivery yes, I think once the communication is sorted out, things like time, cost and quality should be really good as well because surely when you are talking about time, even the things like activity definition regression estimation schedule, development schedule control, all those things that have to do with time management they will enhance project delivery. Consequently, things like resource planning, control, budgeting, and estimation all those things will be improved. Once there is an information management system that can take work from the beginning to the end, I think it will be an improvement.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

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Node

Nodes\\project 3\How do these information modelling systems collaborate with other stake holders~

	Yes	0.0913	8

1	AC	16/03/2019 7:57 PM

How do these information modelling systems collaborate with other stake holders?
Purpose of collaboration with a stakeholder. I think I just explained that to you about the stakeholder and collaboration; like I said to you is mostly not only meant for small projects but it's for collaboration and the ability to communicate with other stakeholders—it's not the best. Well like I said, these information modelling systems are not very user friendly when we do collaboration with other project stake holders and work without incorporating other software as well as being able to be used during the entire project.

Nodes\\project 3\How long have you used information modelling systems~

	Yes	0.0221	8			
				1	AC	16/03/2019 7:57 PM

How long have you used information modelling systems?
Well, you said how long I have been using this Ims, I have been using it for about 5 years now.

Nodes\\project 3\How useful are these information modelling systems if any in your everyday project delivery~

	Yes	0.1301	8			
				1	AC	16/03/2019 7:57 PM

How useful are these information modelling systems if any in your everyday project delivery?
Well, there are difficulties one sees, and different from another person who sees how useful these information modelling systems are that we use each day for the project delivery. It is very handy, it is good yes, we use it almost daily, and it has got good and interesting features. I like message pops out some popular navigation tools. When you are using it go to help desk, you can easily navigate into it and get everything that you need there. It also has an easy information sharing; I do not know how I can explain it. This is part of what we do, however its customisation is a bit tricky, although we can use it, and we use it almost every day I like it even though there are a few things that are not working properly, well, especially the functionality.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

Nodes\\project 3\What information modelling system currently used in project management sector in the context of building and construction projects in Australia~

	Yes	0.2302	8			
				1	AC	16/03/2019 7:57 PM

What information modelling system currently used in project management sector in the context of building and construction projects in Australia?
The software that we use for project management and Information wanting system in our company is called Freshdesk. It is a cloud-based system and it normally works with the support of a technical team staff, and everything that you do is to check the project progress and manage it. I think that is suitable for project management, it is just ok especially with things like a smart automation, even the frequently asked questions section everything is there for communication.
Freshdesk next generation help desk customer queries from phone email website and even social networking sites and one can automatically convert it into another form of document instantly solving customer problem with the simple and smart interface. Finally, any task comment comes with acknowledgement that you read and the comments with actual time and you will see a list of all tasks assigned to you. It is updated instantly based on any new changes happening across the team members. The system records all your work you cannot get that from spreadsheet get updates on the work that matters to you and your follow pass rate from the inbox. You can reduce noise and focus on what's important your dashboard is where you can see the status of all the projects you are leading working on or keeping track of at the click of a button. This product automatically populates in Google Sheets from or custom reporting into detailed reporting.

Nodes\\project 3\What shortfalls are you experiencing and what do you think done will be the future problems with the current

	Yes	0.1148	8			
				1	AC	16/03/2019 7:57 PM

What shortfalls are you experiencing and what do you think done will be the future problems with the current?
I see the inability to interact with the team especially like the assigning of emails and sending emails to the correct department to the correct person in the department. If you forget to hit a forward button, then you would lose some of the information. There is a function that is called forward sorting, something like that it's difficult when you don't know the system anyway, but if you forget to do that it was almost all your work that you've done so far you will lose most of it. So, if you couldn't receive and you hit that button by mistake you lose all the work, and I've done this and I've seen that it is almost impossible to reverse what we have done.

Nodes\\project 3\What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents

	Yes	0.0546	8			
				1	AC	16/03/2019 7:57 PM

What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents?
That is a tricky a question, the project management structure that we will be hoping to be looking at is something that can be able to address the ability to communicate between team members and stakeholders.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

Nodes\\project 3\What would be key attributes qualities if the proposed project management information modelling system for such projects would you want

	Yes	0.1381	8			
				1	AC	16/03/2019 7:57 PM

What would be key attributes qualities if the proposed project management information modelling system for such projects would you want?
One of the key attributes that I want on an information modelling system like this one is probably things like our being able to start and finish the project. If one can start and finish the project, then everything is good but means if everything is going on well that means everything will go well in terms of the information systems. I can see one of the biggest challenges that we are having now is for us not to be able to use one software. Now we are using different software to complete our projects. That is, you can use BIM, and use things like Auto card to make sure that you complete a project. So, when we are looking at another software, we will probably look at an information warning system that can help us in doing The Project from the beginning of the end.

Nodes\\project 3\Would such elements improve project delivery in terms of communications of stake holders

	Yes	0.0995	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of communications of stake holders?
As I explained before, if there were another project management information modelling system that would cater for project management from the beginning to the end, that is from my initiation until maybe to disposal, elements like communication, in general, and delivery of projects would definitely improve.
That's just my thought but we are yet to see if the best information modelling system comes or you can play; we'll just see how it goes but if I can see things that should be good. And there should be an improvement in terms of our communication and delivery of projects.

Nodes\\project 3\Would such elements improve project delivery in terms of time, cost, and quality

	Yes	0.1118	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of time, cost, and quality?
Yes of course. Once you have a project management information modelling system, you like the way you were explaining in the beginning before the interview. Another project management information modelling as per your proposal or something would increase the production in the Project. That will increase and improve the product delivery in terms of time, cost, and quality. And once time, cost in quality is in place the project is good because it will be fun. If time, cost, and quality are done, then everybody is happy, so if we get those things done, that would be much better and improve project delivery in terms of time, cost, and quality.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

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Node

Nodes\\project 3\How do these information modelling systems collaborate with other stake holders~

	Yes	0.1024	8			
				1	AC	16/03/2019 7:57 PM

How do these information modelling systems collaborate with other stake holders?
Stakeholder communication and collaboration, some better things could be done especially in terms of collaboration. I do not know how but I can explain this, but if you had a chance I would come and show you what. I'm not sure if I am allowed to do that, but if you haven't experienced a lot of different project management tools it will be difficult for you to understand what I'm talking about, but if another maybe one day, if we could find another project management information system it would help us more.

Nodes\\project 3\How long have you used information modelling systems~

	Yes	0.0542	8			
				1	AC	16/03/2019 7:57 PM

How long have you used information modelling systems?
I have used this software for a long time now; I think I have been using it for almost 8years now and yes there are some things that we thought would be improved. I hope someday one and help us especially in terms of project management information modelling systems.

Nodes\\project 3\How useful are these information modelling systems if any in your everyday project delivery~

	Yes	0.1056	8			
				1	AC	16/03/2019 7:57 PM

How useful are these information modelling systems if any in your everyday project delivery?
I have used this management tool for many years it is difficult not to love this software. However, there is something that I feel that can be done— it can be able to put everything together to have one optimal Ims in order to make projects comparatively faster and be able to plan all that you need, and to be able to do things in other software like in Excel. It is difficult to give you scenarios over how difficult or how is it, but it is not too bad, it is alright, it is just a software that can be used here.

Nodes\\project 3\What information modelling system currently used in project management sector in the context of building and construction projects in Australia~

	Yes	0.1779	8			
				1	AC	16/03/2019 7:57 PM

What information modelling system currently used in project management sector in the context of building and construction projects in Australia?
Excel is one of the tools we use in project management for modern businesses that we use at our company but works in alliance with Building Information Modelling Systems (BIM). This is the project management information modelling system used as software for project management. The other thing about excel is that it can be able to give you a better plan. We have about 50 people in our organisation and we sometimes do about 10 projects at a time, it is a good project management software. When you use it, you will be able to focus on work and be able to make data entry in any form in time. However, there's still some drawbacks about it which are some people like us project managers that would want to be addressed so that it can be something that it can be completely relied upon for complete delivery of project management, especially in this kind of construction environment in Australia.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On

Nodes\\project 3\What shortfalls are you experiencing and what do you think done will be the future problems with the current

	Yes	0.1140	8			
				1	AC	16/03/2019 7:57 PM

What shortfalls are you experiencing and what do you think done will be the future problems with the current?
I think the shortfall that we can talk about now, I could write down for you, maybe if you had given me enough chance, or if I knew what kind of questions you are going to ask, I would have been able to write down for you because there are a lot of our pros and cons. The other shortfall is in transforming from one level of project progress to the other. With another software probably it could have been better. I mean another software that could be able to be used from the origination to the end of the project without collaborating with other software.

Nodes\\project 3\What would be key attributes qualities if the proposed project management information modelling system for such projects would you want

	Yes	0.1028	8			
				1	AC	16/03/2019 7:57 PM

What would be key attributes qualities if the proposed project management information modelling system for such projects would you want?
If there is a project management information modelling system that would cater from initiation until the end of the project life cycle that would really help us as project managers. Also, the major attributes I would want in such a PMIMS Project management information modelling system would be making sure the communication is done punctually making sure visual aids are included making sure there is a flawless communication channel amid stake holders and the client

Nodes\\project 3\Would such elements improve project delivery in terms of communications of stake holders

	Yes	0.2005	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of communications of stake holders?
Assuredly these elements will improve project delivery, and definitely have a better project management environment and communication like you are asking, about communication and a better information modelling system, definitely what we are experiencing now is not what we would prefer as project managers. I could have answered this one before yes, these elements would improve communication with stake holders, and this would improve communication between stake holders, because it automatically improves delivery time delivery in terms of communication and delivery.
What would a framework structure of a PMIMS (Project Management information modelling system) for such projects look like for their background contents?
It will be good to have a project life cycle and product Ims that starts from initiation, planning, project definition, and documentation as well as delivery, and until disposal that will help us a lot if we have such a good information modelling system, because without that it's surely very difficult in terms of our project management.

Classification	Aggregate	Coverage	Number of Coding References	Reference Number	Coded by Initials	Modified On
Nodes\\project 3\Would such elements improve project delivery in terms of time, cost, and quality						
	Yes	0.1342	8			
				1	AC	16/03/2019 7:57 PM

Would such elements improve project delivery in terms of time, cost, and quality?
Project management knowing all the areas of property management that is about the integration of project management; how to harness the processes to ensure that all the various elements are met like project scope management, time management, cost and quality management as well as project delivery. Since the successful success of a project is moored to time management, management of the cost of project

8.8 Ethics approval to conduct focus group interviews.

Research Master

Human Ethics Application

Application ID: H18REA035

Application Title: The lack of information r
and construction projects

Date of Submission: 05/03/2018

Primary Investigator: Mr Agrippa Chifeya; Prin

Other Personnel: A/Pr David Thorpe; Princ

Instructions

Instructions

Pre-Application

1 Application Type

Ethics category*

Human Research Ethics Application

1.1 Has this application been reviewed and approved by another Human Research Ethics Committee (HREC)? *

○Yes◉No

1.2 Does this research project involve?
Tick all that apply.

- ☑ Direct recruitment and/or observation of human participants
- ☐ Use and/or disclosure of existing data sets and/or archival data
- ☐ Use and/or disclosure of existing bio specimen collections
- ☐ Any form of genetic testing or analysis of genetic material
- ☐ Clinical trial

Review outcome comments for ***Application Type***.

This question is not answered.

2 Potential Participant Group

Does this project involve (a) the direct recruitment of participants that specifically targets, and/or (b) the use of existing data and/or tissue of participants from a project that specifically targeted…?

2.1 Women who are pregnant, the human foetus, or human foetal tissue? *
○Yes◉No

2.2 Children or young people under the age of 18 years? *
○Yes◉No

2.3 People with a cognitive impairment, an intellectual disability, or a mental illness? *
○Yes◉No

2.4 People considered to be a forensic or involuntary patient? *
○Yes◉No

2.5 People with impaired capacity for communication? *
○Yes◉No

2.6 Prisoners or people on parole? *
○Yes◉No

2.7 People highly dependent on medical care, including a person who is unconscious? *
○Yes◉No

2.8 Military personnel? *
○Yes◉No

2.9 Military veterans? *
○Yes◉No

2.10 People who would not usually be considered vulnerable but would be considered vulnerable in the context of this project? *
○Yes◉No

2.11 Aboriginal and/or Torres Strait Islander peoples? *

○Yes◉No

2.12 Hospital patients? *

○Yes◉No

2.13 People in other countries? *

○Yes◉No

2.14 People who would consider English to be their second language? *

○Yes◉No

Review outcome comments for ***Potential Participant Group***.

This question is not answered.

3 Proposed Procedures

Does this project include...

3.1 Any physical, psychological, social, economic, and/or legal risks greater than inconvenience or discomfort, in either the short or long term, resulting from participation in, or use of data in this project? *

○Yes◉No

3.2 Application of randomised trial methods, innovations in clinical practice (interventions and/or therapies), or clinical trials? *

○Yes◉No

3.3 Human genetics? *

○Yes◉No

3.4 Research intended to study and/or expose illegal activity? *

○Yes◉No

3.5 Radioactive substances and/or ionising radiation? *(e.g., DXA, X-ray)* *

○Yes◉No

3.6 Sensitive and/or contentious issues? *(E.g. suicide, eating disorders, body image, trauma, violence, abortion, etc.)* *

○Yes◉No

3.7 Toxins, mutagens, teratogens, or carcinogens? *

○Yes◉No

3.8 Deception of participants, concealment, or covert observation? *

○Yes◉No

3.9 Seeking disclosure of information which may be prejudicial to participants? *

○Yes◉No

Review outcome comments for ***Proposed Procedures***.

This question is not answered.

4 Operational Requirements

Does this project involve...

4.1 Recruitment of USQ students (as participants)? *

○Yes◉No

4.2 Recruitment of USQ employees (as participants)? *

○Yes◉No

4.3 International travel for data collection purposes? *

○Yes◉No

4.4 Collecting data in a rural and remote setting? *

○Yes◉No

4.5 The collection, use or disclosure of IDENTIFIABLE personal information (e.g., names and contact details on consent forms) *

○Yes◉No

4.6 The collection, use or disclosure of RE-IDENTIFIABLE personal information (e.g., when identifying details are replaced by codes, pseudonyms, etc.) *

○Yes◉No

4.7 The collection of information by observing participants **WITHOUT** their knowledge? *

○Yes◉No

Review outcome comments for ***Operational Requirements***

This question is not answered.

Application Detail

5 Project Title and Summary

5.1 Project Title*

The lack of information modelling systems across all project management phases that are contributing to the failure of some building and construction projects in Australia.

5.2 Using plain language, provide a succinct description of the background and the potential significance of the research project. *

This research project will investigate an emerging disruption in the construction and building sectors from the apparent slow uptake of information modelling (IM) systems in project management practices. IM systems currently assist in the design and construction phases of building and construction projects and help to create a collaborative process involving the project team, owners, contractors, and designers during those phases. Existing modelling systems include Building Information Modelling (BIM), Building Environment Modelling (BEM), Building Energy and Environment Modelling (BEEM) and Building Performance Modelling (BPM).

5.3 Clearly state the aims and/or hypotheses of the research project. *

To determine if a project management IM system (PMIM) can be developed to provide better project outcomes in the context of building and construction projects in Australia, and if so, what would be the key attributes of such a system.

Review outcome comments for ***Project Title and Summary***.

This question is not answered.

6 Investigators

Your Academic Organisational Unit (AOU) number is a six-digit project code and is normally aligned to that of your business unit (i.e. school or department). The AOU entered is to reflect the business unit that will be responsible for providing the necessary resources to support this project.

If unknown, you can search for your AOU by typing the name of your school or department in the box and clicking on the magnifying glass symbol.

6.1 Enter your Academic Organisational Unit (AOU) number in the box below (if known). For example, if you are conducting your research on behalf of the School of Psychology and Counselling, enter 'psychology' and click on the magnifying glass symbol. If the correct project code is not returned, choose the appropriate project code from the list available. The name of the chosen business unit will then appear below the AOU box line.

If you are not a USQ Staff or Student, please enter "EXTERNAL".

*

Faculty of Bus, Edu, Law, Arts

6.2 Principal Investigator

Click on Principal Investigator name link and complete all required (*) fields in this section. There can only be one Principal Investigator per project.

1	Order	1
	RIMS Code	0000173928
	Position	Principal Investigator
	Title	Mr
	First Name	Agrippa
	Last Name	Chifeya
	Full Name	Mr Agrippa Chifeya
	Student Researcher?	Yes
	Primary Investigator?	Yes
	Primary Contact?	Yes
	ORCID ID (if known)	

	Email Address	W0096569@umail.usq.edu.au
	Secondary Email	
	Mailing Address Address Line 1	
	Address Line 2	
	Address Line 3	
	Address Line 4	
	Suburb/City	
	State	
	Postal Code	
	Country	Australia
	Contact Phone	
	Mobile Phone	

6.3 Other Investigators

Add all other investigators that will be associated with this research project in this section.

Click on each investigator's name link and complete all required (*) fields.

Add external collaborating investigators by clicking on the "Add External Person" button and completing all required (*) fields.

1	Order	1
	RIMS Code	0000157221
	Position	Principal Supervisor
	Title	Associate Professor
	First Name	David
	Last Name	Thorpe
	Full Name	A/Pr David Thorpe
	Student Researcher?	No
	Primary Contact?	No
	Person Type	Internal

	ORCID ID (if known)	
	Email Address	David.Thorpe@usq.edu.au
	Secondary Email	
	Mailing Address Address Line 1	
	Address Line 2	
	Address Line 3	
	Address Line 4	
	Suburb/City	
	State	
	Postal Code	
	Country	Australia
	Contact Phone	
	Mobile Phone	

Review outcome comments for ***Investigators***.

This question is not answered.

7 Benefit and Risk

7.1 Outline the benefits to participants and/or to the community because of this research being conducted. *

To develop project management IM system (PMIM)which can be used to provide better project outcomes in the context of building and construction projects in Australia, and if so, what would be the key attributes of such a system.

7.2 Define the risks, in either the short and/or long term, of participation in this project *(e.g. physical, psychological, social, economic, or legal risks greater than inconvenience or discomfort)* *

Lost information and data.
Lack of enough resources for data collection
Time imposition on participants

7.3 Are all these risks outlined in the Participant Information Sheet or within the explanatory statement at the beginning of a data collection instrument, and (where relevant) on the consent form? *

◉Yes○No

7.4 Outline the arrangements planned to minimise the risks involved in this project. *

There will be minimal risk since questions are structured to reduce time imposition

7.5 What will you do in cases where unexpected events or emergencies occur as a result of participation in this project?
For example, what facilities or services are available to deal with events such as adverse drug reaction, revelation of child abuse, illegal activities, participant becomes distressed during or after data collection.*

Inform the University, supervisor and HOD if the issue is not an emergency, if it is an emergency, then call the emergency services as soon as possible and stop the interview.

7.6 Is an appropriate list of referral services available within the Participant Information Sheet or explanatory statement? *

○Yes ○No ◉Not applicable

7.7 Outline the strategies that you have in place to reduce any risks to the researchers. *

Explaining the process of conducting research to avoid preconceived ideas. Remaining polite and respectful even if a difference in opinion arises. Making sure the meet place is not an awkward or secluded place

Review outcome comments for ***Benefit and Risk***.

This question is not answered.

8 Type of Research

Type of research - 1

8.1 Are you, as the Principal Investigator, a current USQ employee or student? *

◉Yes ○No

8.1.1 Will this project be undertaken **predominately** in a student capacity? *

◉Yes ○No

8.1.1.1 Program level: *

- ○ Honours
- ○ Masters
- ◉ Doctoral
- ○ Other

8.1.1.2 Program name: *

DBAR

8.1.2 Will this project be undertaken as a **USQ Course project**? *

○Yes ◉No

8.2

Type of research - 2

Tick all that apply.

*

- ☐ Action research
- ☐ Clinical research
- ☑ Qualitative

☐ Social science
☐ Other
☐ Epidemiological
☐ Mental health
☐ Public health and safety
☐ Quantitative
☐ Case study
☐ Clinical trial / use of drug or therapeutic device
☐ Medical research
☐ Oral history / biographical

Review outcome comments for ***Type of Research***.

This question is not answered.

9 Conflict of Interest

9.1 Do any of the investigators on this project have an actual, perceived, or potential personal or financial conflict of interest in the outcomes of this research, or in any of the organisations involved with, or funding this project? *

○Yes◉No

Review outcome comments for ***Conflict of Interest***.

This question is not answered.

10 Funding

10.1 Has funding been obtained for this project? *

○Yes◉No

10.1.1 Are you applying for funding for this project? *

○Yes◉No

Review outcome comments for ***Funding***.

This question is not answered.

11 Data Access and Security

11.1 Describe the security arrangements for the storage of the data. Include details of how and where the data will be stored and who will have access to this information. *

All data will be kept in a safe on USQ cloud storage for up to 5 years and concert forms for 15 years. The information will be available to other researchers and anonymity will be guaranteed since the participants will be coded.

11.2 Will a non-USQ third party have access to the data during this research? *

◉Yes○No

11.2.1 Explain how the participants will be informed about third party access to their data and outline how you will ensure that their privacy is protected during the data transfer process to the third party. *

The information will be available to participants and anonymity will be guaranteed since the participants will be coded.

11.3 Will some or all of the research data be openly or publicly available at some time in the future? **Note:** It is recommended that unless your data can not be shared for ethical, privacy or confidentiality matters, that you incorporate the future use of data in your research design and include a statement within the participant information sheet/explanatory statement to this effect.*

◉Yes ○No

11.3.1 Outline which data will be openly or publicly available and how this will be shared. *

The information will be available to public and anonymity will be guaranteed since the participants will be coded.

11.4 Are the data access and security arrangements detailed in the Participant Information Sheet or explanatory statement? *

◉Yes ○No

11.5 How will the data be confidentially disposed of if it is no longer required? **Note:** Whilst there is a minimum retention period for all research data (refer Queensland Government General Retention and Disposal Schedule (GRDS) - [refer disposal authorisation 1046 & 1047], USQ encourages researchers to responsibly store research data for future research use for as long as practicably possible.*

5 years and concert sheets for 15 years
The Records Disposal Register will be made available, upon request, to the Manager Corporate Records for the purposes of satisfying recordkeeping and Right to Information Act 2009 compliance issues.(Queensland)
If it's paper I will shred it and delete all digital files

Review outcome comments for ***Data Access and Security***.

This question is not answered.

12 Communication of Research Outcomes

12.1 Indicate in which format/s the research will be published and/or communicated. *Tick all that apply.* *

- ☑ Thesis
- ☐ Journal article
- ☐ Book / book chapter
- ☐ Conference
- ☐ Dataset
- ☐ Reports to participants
- ☐ Report to organisation
- ☐ Report to community or group
- ☐ Other

12.2 How will the identity of participants be disclosed in the communication of the results? *

- ☑ non-identifiable data
- ☐ re-identifiable data
- ☐ individually identifiable data
- ☐ other

12.3 Describe how participants and/or other interested stakeholders will be able to access the results and/or request a copy of a summary of the results. *

They will need to communicate with the researcher, and a summary of findings will be provided.

12.4 Will participants be subjected to any physiological or psychological testing during this project? *

○Yes◉No

Review outcome comments for ***Communication of Research Outcomes***.

This question is not answered.

No. of Human Participant Groups

Participant Group Recruitment

PG - How many groups of participants will you be recruiting and/or observing for this research project? *

1.00

This question is asking you to think about how many groups of participants you are likely to recruit as part of this project. The method of participant recruitment and how they will provide consent may change depending on the participant's age and how you propose to conduct that part of the project.

For example:

- If you are conducting an online survey, followed by interviews with some of the survey participants, it is likely that you will recruit "2" groups. This will be the "survey group" and the "interview group".
- If you are conducting multiple focus groups with the same focus group questions, it is likely that you will recruit "1" group but offer the same content multiple times. This can be conveyed in the next section.
- If you are conducting interviews with different groups, for example, students, teachers, and school principals, then it is likely that you will recruit "3" groups.

The number of groups of participants you enter here will provide specific questions in the next section relevant to that group. That is, Group 1 = G1, Group 2 = G2, Group 3 = G3, and so on.

Sufficient space has been provided for up to **five** participant groups. If you propose to use more than five participant groups in your research, contact the Ethics Officer for further advice.

Review outcome comments for ***Participant Group Recruitment***.

This question is not answered.

Group 1 - Participant Recruitment and/or Observation

G1 - Participant Overview

PG1.1 Participant group 1 working title. *(e.g. student focus group; teacher survey)* *

Project managers

PG1.2 How many participants are expected to be recruited in this group? *

8.00

PG1.3 Describe who the participants in this group are. *

Project managers who have a vast experience in the sector

PG1.4 Where will this group of participants be recruited from? *

Australian Institute of Project Managers

PG1.5 Are the participants in this group likely to be under 18 years of age? *

○Yes◉No

PG1.6 Is there a pre-existing (unequal) relationship between the participants, and anyone involved in recruiting and/or collecting data from this group of participants? *(E.g. teachers and/or lecturers/students, doctors/patients, employers/employees, etc.)* *

○Yes ◉No

PG1.7 Do these participants have any cultural needs? *(e.g., specific consent arrangements or sensitivities, etc.)* *

○Yes ◉No

Review outcome comments for ***G1 - Participant Overview***.

This question is not answered.

G1 - Recruitment Method

PG1.8 Do you have any criteria for the selection, inclusion, or exclusion of participants for this group to take part in the research? *(e.g. minimum age requirements)* *

○Yes ◉No

PG1.9 Indicate which method/s you will use to recruit these participants: *

- ☑ Email
- ☑ Personal contacts
- ☐ Telephone
- ☐ Advertisement
- ☐ Mail out
- ☐ Snowballing
- ☐ Participants from another study
- ☐ Participants approached in person by research team
- ☐ Participants will NOT be actively recruited - they will be observed without their knowledge
- ☐ Other

PG1.10 Indicate how you will obtain the contact details of these participants. *

- ☐ From the participants themselves
- ☐ From a public domain source
- ☑ From a private or third-party source
- ☐ Other

PG1.10.1 Provide details about this source and its terms of use. *Please note that obtaining identifiable personal information without consent may constitute a breach of Queensland and Australia privacy legislation.* *

Australian Institute of Project Managers Group, provides a platform for project managers to interact, permission will be sought from individual participants.

PG1.11 Explain who will invite these participants to be involved in this project. *

AIPM Group discussion invitation

PG1.12 Will you be offering payment or any other incentives to this group of participants? *

○Yes ◉No

Review outcome comments for ***G1 - Recruitment Method***.

This question is not answered.

G1 - Data Collection Methods

PG1.13 Will you collect data via questionnaires / surveys? *

○Yes◉No

PG1.14 Will you collect data via interviews or focus groups? *

◉Yes○No

PG1.14.1 Provide further detail about the **interviews or focus groups**, including: how many sessions will be held; where and at approximately what time (or timeframe) will the sessions be held; who will be present from the research team; how many participants will be present at each session; who will conduct or facilitate the session; will there be a debriefing process (and if yes, what will this involve)?

Attach a copy of your interview or focus group questions (if known) or broad topics in the document upload section.

*

Data collection will be through interviews. The copy and questions to be asked is attached. The duration of the interview will.be about 20mins. It will be held at a neutral venue of the participant's choice. The researcher will facilitate the interview.

PG1.14.2 Will your interview or focus group session be audio or video recorded? *

◉Yes○No

PG1.14.3 Will you arrange for transcription of the audio or video recording? *

◉Yes○No

PG1.14.3.1 Provide detail on how you will handle the transcription process of the audio or video recording, including who will be involved in transcribing the data, whether the participants will be provided an opportunity to review and/or edit the transcribed document, and how you will safely manage the data transfer process.*

The transcription process will be done by the researcher and data will not be sent to the participants; however, they will be provided a summary of findings of they need to know.

PG1.15 Will you collect data via observation? *

○Yes◉No

PG1.16 Will you collect data via photography / videography? *

○Yes◉No

PG1.17 Will you collect data via psychological inventories or any other published, standardised test? *

○Yes◉No

PG1.18 Will you collect data via collection of human bio specimens? *

○Yes◉No

PG1.19 Will you collect data via responses to tasks, stimuli, or simulations? *

○Yes◉No

PG1.20 Will you collect data via administration of a substance? *

○Yes◉No

PG1.21 Will you collect data via any other procedure not outlined above? *

○Yes◉No

Review outcome comments for ***G1 - Data Collection Methods.***

This question is not answered.

G1 - Data Collection Procedure and Competence

PG1.23 Provide details about what you are asking participants in this group to do or what is to be done to them. Include a step-by-step description of what participants will experience if they choose to take part in this project. *

The questions to be asked will be the following:
1. What are IM systems currently used in the project management sector in the context of building and construction projects in Australia?
2. What would be the key attributes of a PMIM system for such projects?
3. What would a framework for a PMIM system for such projects look like?

PG1.24 How much time are you asking of participants in this group and when will this time be required? *(E.g. 30 minutes after class).* *

15 - 30 mins

PG1.25 Where will the data be collected (venue and geographical location)? *(e.g. front of 'venue')* *

Selected PMs in Brisbane

PG1.26 Does the research involve the administration of any tests or procedures that require qualifications? *

○Yes◉No

PG1.27 Does the research involve measures or procedures that are **diagnostic** or **indicative** of any **medical** or **clinical** condition, or any other situation of concern? *(E.g. anaemia, bulimia, anorexia, anxiety, suicidal tendencies, aggressive behaviours, etc.)* *

○Yes◉No

Review outcome comments for ***G1 - Data Collection Procedure and Competence***.

This question is not answered.

G1 - Consent Method

PG1.28 Are these participants able to consent for themselves? *

◉Yes○No

PG1.29 Will you use a written Participant Information Sheet or Explanatory Statement to inform participants about this project? *

◉Yes○No

PG1.30 Will these participants be fully informed about the true nature of the research? *

◉Yes ○No

PG1.31 Indicate how you will obtain consent from this group of participants. *

- ○ Implied consent
- ◉ Consent form (must be attached with this application)
- ○ Opt-out consent
- ○ Other

Consent may be expressed in several ways. **A signed consent form** has traditionally been the accepted method of documenting a participant's consent to participate in a research project. Where used, information about the research project is generally presented in a participant information sheet, explanatory statement, or similar document that a participant retains. The process of communicating information to participants and seeking their consent should not be merely a matter of satisfying a formal requirement. The aim is mutual understanding between researchers and participants. This aim requires an opportunity for participants to ask questions and to discuss the information and their decisions with others if they wish.

PG1.31.2 Outline the process by which the participants will give consent and how they return the consent form to the researchers. *

Forms will be sent to them. Attached is the sample form

Review outcome comments for ***G1 - Consent Method***.

This question is not answered.

Documents

16 Documents

16 Has this application been peer reviewed?

○Yes ◉No

Please arrange to have your ethics application peer reviewed prior to submission. The USQ Peer Review Checklist is available from the Research Integrity website.

17

Below is a list of documents that may be required with this application. Upload each applicable item against the matching document name. If you require more than one document to be uploaded per item, please use the 'Add New Document' button (for further assistance please click the item help icon).

****Note**** there are multiple pages in the grid below, use the change page buttons at the bottom of the grid to browse each page.

Description	Reference	Sof
Participant Information Sheet and/or Explanatory Statement (as required, for each participant group)	Information Sheet (Consent).docx	✓
Consent form (as required, for each participant group)	Consent form (1) revised.docx	✓

Copy of questions (or sample) - for collecting data via interviews/focus groups	Research Questions.docx	✓

Review outcome comments for ***Documents*** (1).

This question is not answered.

Review outcome comments for ***Documents*** (2).

This question is not answered.

Review outcome comments for ***Documents*** (3).

This question is not answered.

Review outcome comments for ***Documents*** (4).

This question is not answered.

Review outcome comments for ***Documents*** (5).

This question is not answered.

Declaration

Declaration

USQ Principal Investigator Declaration

I the undersigned declare that I:

- have completed the peer review of this ethics application, in accordance with the USQ Statement on Peer Review;
- accept ultimate responsibility for the ethical conduct of this research project in accordance with the principles outlined in the University's Research Code of Conduct Policy, the Australian Code for the Responsible Conduct of Research (2007), and the National Statement on Ethical Conduct in Human Research (2007);
- Have ensured that all people involved in this research project understand and accept their roles and responsibilities.
- Undertake to conduct this research project in accordance with the protocols and procedures outlined in the proposal as approved by the University of Southern Queensland Human Research Ethics Committee (USQ HREC).
- Inform the USQ HREC of any changes to the protocol after the approval of the Committee has been obtained using the USQ HREC Amendment Application procedure AND inform all people involved in this research project of the amended protocol.
- have read and agree to comply with the University of Southern Queensland Research Data Management Policy and pursuant policies and procedures and have a plan for managing and/or sharing Research Data securely; and
- Understand and agree that project files, documents, research records, and data may be subject to inspection by the University of Southern Queensland, USQ HREC, a research integrity officer, the sponsor or an independent body for auditing and monitoring purposes.

18 USQ Principal Investigator Declaration

1	Full Name	Mr Agrippa Chifeya
	Position	Principal Investigator
	Declaration signed?	Yes
	Signoff Date	03/12/2017

8.9 Nvivo coding (data analysis)

Table 22: Nvivo coding (data analysis)

File Type	Number of Files	Number of Coding References	Number of WordsDuration Coded Coded
Nickname:			
Classification:			
Aggregated:			
	852	89	
Nickname:			
Classification:			
Aggregated:			
Document	8	8	982
Nickname:			
Classification:			
Aggregated:			
Document	8	8	554
Nickname:			
Classification:			
Aggregated:			
Document	8	8	1,010

File Type	Number of Files	Number of Coding References	Number of WordsDuration Coded Coded
Nickname:			
Classification:			
Aggregated:			
Document	7	8	180

Nickname:

Classification:

Aggregated:

Document	7	8	152

Nickname:

Classification:

Aggregated:

Document	8	7	54

Nickname:

Classification:

Aggregated:

Document	7	7	1,627

Nickname:

Classification:

Aggregated:

Document	7	7	271

File Type	Number of Files	Number of Coding References	Number of WordsDuration Coded Coded

Nickname:

Classification:

Aggregated:

Document	7	8	696

Nickname:

Classification:

Aggregated:

Document	8	8	260

Nickname:

Classification:

Aggregated:

Document	7	8	99

Nickname:

Classification:

Aggregated:

Document	7	8	106

Nickname:

Classification:

Aggregated:

Document	8	8	125

Reports\\Code Summary Report

File Type	Number of Files	Number of Coding References	Number of WordsDuration Coded Coded

Nickname:

Classification:

Aggregated:

Document	8	8	413

Nickname:

Classification:

Aggregated:

Document	8	8	111

Nickname:

Classification:

Aggregated:

Document	8	6	722

Nickname:

Classification:

Aggregated:

Document	8	7	253

Nickname:

Classification:

Aggregated:

Document	8	6	113

Reports\\Code Summary Report

File Type	Number of Files	Number of Coding References	Number of WordsDuration Coded Coded

Nickname:

Classification:

Aggregated:

Document	8	8	742

Nickname:

Classification:

Aggregated:

Document	8	8	1,021

Nickname:

Classification:

Aggregated:

Document	8	66	66

Nickname:

Classification:

Aggregated:

Document	8	220	220