SCRUM PROJECT FRAMEWORK: EXPLORING AGILE PROJECT MANAGEMENT IN A NON-ITC ORGANISATION.

A Thesis submitted by

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Abstract

This study used the Agile modality Scrum to investigate practitioners' perceptions of the Scrum project framework and evaluated the frequency, mode and tools of communication in successful projects using the Scrum framework, whilst identifying any problems arising from the introduction of Scrum. A review of the literature highlighted the effectiveness of Scrum in studies that applied Agile project management in an IT environment. The literature identified that small cross-functional teams, frequent communication, quality communication, clear project goals and project transparency are effective for project management success. This research investigated five projects, as a case study, using Scrum as the project management framework, within small cross-functional teams in the non-ITC environment. This case study analysed the post-Scrum project team retrospective meetings to identify common themes in the participants feedback relating to the effectiveness of Scrum as a project management framework. Common themes identified were communication tools, project clarity, participant accountability and project momentum. These identified themes were used to create a survey artefact to investigate the legitimacy of the identified themes. The legitimacy of the retrospective common themes was confirmed by the survey responses through qualitative and supporting quantitative analysis, indicating Scrum as an effective project management framework outside the software development arena. Participant responses indicated the efficacy of daily communication frequency through the stand-up meetings, and project clarity and individual accountability through the use of Scrum board. Findings of the survey indicated the daily stand-up meeting was most effective communication mode and tool to facilitate interaction and exchange of information during the projects. The study identified a problem of perceived harassment, relating to the level of accountability/transparency of the Scrum process.

Certification of Thesis

This Thesis is entirely the work of Ross Forbes except where otherwise
acknowledged.

This work is original and has not previously been submitted for any other award.

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Acknowledgements

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1   CHAPTER ONE: Introduction

Organisations involved in the healthcare industry are experiencing a change of expectations from providers and payers, with providers and payers moving away from traditional procurement models of supplier organisational business silos (PwC, 2016). Healthcare providers and payers are now expecting coordinated, integrated solutions and expecting suppliers to create alignment within and between their organisational silos (PwC, 2016). This change is in response to the increasing chronic disease prevalence where the chronically ill require complex care (Desmedt et al., 2016). The providers and payers expect supplier organisations to effectively engage across their internal organisational silos and deliver value beyond the product (PwC, 2016). Most notably, new supplier entrants to healthcare (e.g. Apple, Sony, Google and IBM) are building digital health solutions while engaging with customers rapidly, which has further changed the expectations of providers and payers (Belcredi et al., 2017; Walsh, 2018).

Suzman (2015) indicated the results of these expectation changes, are a move away from clinician lead procurement, where the clinician makes the purchasing decision based on product features and benefits and cost, to the hospital economic buyer who uses value based on the product and related integrated models of care to make purchasing decisions. Integrated models of care can be described as delivery systems that coordinate a range of professionals and skills from the clinical product and intervention through to the longer-term after hospital care effect (Nolte & Pitchforth, 2014). This economic buyer, who often resides out of the immediate clinical area, is expecting rapid supplier responses, and reference to the economic value of suppliers' products and services (Suzman et al., 2015).

As opposed to the integrated model of care, medical technology supplier organisations are typically structured with internal organisational business units, silos, which can appear to stand in opposition to each other (Cilliers & Greyvenstein, 2012). Employees are recognised and rewarded within their organisational silo which encourages behaviour which benefits themselves and their organisational silo, rather than the wider corporate organisation (Briody & Erickson, 2014; Diamond, Stein, & Allcorn, 2002; Harter, Schmidt, & Hayes, 2002). This restrictive behaviour can lead to communication breakdown within organisational silos, as well as a breakdown in

cooperation and coordination with external stakeholders (Fenwick, 2009). Consequently, the organisation falls short of meeting the needs of its internal and external stakeholders and customers (Stone, 2004). In a 2003 survey on leadership challenges by the American Management Association, Stone (2004) noted that "getting people who have different agendas to work together is amongst the biggest obstacles facing business today" (p.11).

Referencing organisational silos, Cilliers (2012) noted, "Silos result in the splitting of organisational artefacts and relationships, and impact negatively on relationship forming between individuals and within teams" (p.1). Lepsinger (2016) reported the findings of OnPoint's Execution Gap survey to illustrate challenges among Fortune 500 companies. More than 620 managers were surveyed and reported they struggled to balance conflicting priorities that tend to arise when teams lack shared goals. Notably, 40% of managers believed there was a lack of cooperation across departments and functions to achieve their organisation's strategic goals, and a further 44% of managers did not believe there was a sharing of information and ideas between divisions (Lepsinger, 2016).

These results suggest that it is difficult for large siloed organisations to create internal alignment and to respond quickly and efficiently to external stakeholder's expectations. To avoid these issues, organisations have started looking for rapid, flexible, and adaptive responses to the unexpected global forces resulting in organisations restructuring around teams (Kozlowski & Ilgen, 2006). Cohesive teams enable the harnessing of skill diversity and high levels of expertise to promote rapid response and adaptability (Kozlowski, Gully, Nason, & Smith, 1999).

Project teams are commonplace in organisations, increasingly utilised to improve complex decisions, increase innovation and improve the organisational product and service outputs (Daspit, Justice Tillman, Boyd, & McKee, 2013a; Peters, 1989; Serrador & Pinto, 2015; Sundstrom, 1999). PMI (2013) defined a project as a "temporary activity, an endeavour, undertaken to create a unique product, service or end result" (p.3). Complex decision-making, innovation of new product development, and service and solutions are increasingly being assigned by organisations to project teams rather than individuals (Edmondson & Nembhard, 2009; Mesmer-Magnus & DeChurch, 2009). The advantage to organisations in using

project teams and groups is to reach a higher quality solution by pooling diverse information and experiences to counter the growing complexity confronting organisations (Albert, Balve, & Spang, 2017; Guzzo & Dickson, 1996; Mesmer-Magnus & DeChurch, 2009; Paquette, Frankl, & Ebscohost, 2016; Parker, 1990). The increase in project proliferation goes hand-in-hand with increasing globalisation, competitiveness and an expectation of rapid response in business environments, where uncertainty and change are ever present (Azanha, Argoud, Camargo Junior, & Antoniolli, 2017; Belcredi et al., 2017; Daspit, Justice Tillman, Boyd, & McKee, 2013b; Edmondson & Nembhard, 2009).

Despite the increasing utilisation of projects and prevalence of project teams, the CHAOS report (2011) identified an ongoing high rate of project failures, with large companies (over $500 million annual turnover), and medium sized companies (between $100 and $500 million) having a 9% and 16.2% respective success rate. Furthermore, over 61% of large company projects were challenged of which over 29% were completely cancelled (GROUP, 2011). Nearly half of the managers surveyed by the Standish Group (2011) believed more project failures are occurring at the time of survey than five and ten years previously, as summarised in Table 1.

Table 1: Project Failures

	Than 5 Years Ago	Than 10 Years Ago
Significantly More Failures	27%	17%
Somewhat More Failures	21%	29%
No Change	11%	23%
Somewhat Fewer Failures	19%	23%
Significantly Fewer Failures	22%	8%

Source: CHAOS Report 2011, P.6

Organisations have sought alternative methods of project implementation to counter the challenges of project failures (Serrador & Pinto, 2015). A popular response taken by organisations includes the creation of cross-functional project teams (Holland, Gaston, & Gomes, 2000). Cross-functional teams have been conceptualised as "a group of people who apply different skills, with a high degree of interdependence, to ensure the effective delivery of a common organisational objective" (Holland et al., 2000, p. 233). Griffin (1997) noted decreased product

development cycle time and increased speed to market can be achieved by utilising cross-functional teams. When forming cross-functional project teams, there exists an opportunity to introduce alternative systems and methods for project implementation, enabling the organisation to respond to market challenges and environmental changes while also addressing internal organisational structural issues (Briody & Erickson, 2014; Serrador & Pinto, 2015).

Software development researchers and practitioners have looked for such methodologies, to reduce development time and increase speed to market, turning to a group of project management methodologies referred to as Agile (Serrador & Pinto, 2015). Agile methods of project management have proliferated in the software development arena since the late 1990s, identified by an ethos of self-regulating cross-functional teams (Cervone, 2011; Schwaber, 2004). The Agile group of project management methodologies are structured to embrace both change and flexibility to counter the environmental challenges facing organisations (Kaleshovska, Postolov, Janevski, Josimovski, & Pulevska Ivanovska, 2015; Serrador & Pinto, 2015).

The characteristics of Agile are project team self-organisation along with intense collaboration both within the team and also across organisational boundaries (Cockburn & Highsmith, 2001; Moe, Dingsøyr, & Dybå, 2010). Agile methods are described as constituting less initial planning and having an efficient evolutionary process, embracing uncertainty and customer interactions while using a modified project team (Dybå & Dingsøyr, 2008). Duvall (2013) suggested the introduction of Agile concepts into large traditional organisations may be helpful in solving internal alignment and customer responsiveness challenges.

Further observations have suggested the approach of Agile project methods could address limitations in the traditional approach of waterfall project management (Conforto, Salum, Amaral, da Silva, & de Almeida, 2014; Paquette et al., 2016; Shenhar & Dvir, 2007). There is a belief the waterfall, linear phase gated control models found in traditional project planning are too rigid for the current business environment (Conforto et al., 2014). These more traditional project control models such as waterfall follow a rigid, detailed upfront planning phase followed by rigid execution, with each project phase dependant on the prior phase completion.

In contrast to these linear planning tools, Agile project management helps engender more effective interactions between managers and employees (Paquette et al., 2016). Communication in Agile is improved due to reduced interference, project team co-location, emphasis on face to face communication and the use of feedback loops creating clearly understood messages (Paquette et al., 2016). According to Schwaber and Sutherland (2011) using Agile methodologies can improve project delivery, provide organisations with a competitive advantage and deliver business value earlier. There is increasing research on the benefits of Agile methodologies in the software development arena (Dingsøyr, Nerur, Balijepally, & Moe, 2012; Moniruzzaman & Hossain, 2013; Serrador & Pinto, 2015). However, there remains limited empirical evidence regarding the implementation and effectiveness of these Agile methods outside the software development industry (Dybå & Dingsøyr, 2008; Serrador & Pinto, 2015).

There are various Agile methodologies including Crystal, Dynamic Systems Development Method, Feature Driven Development, Adaptive Software Development, xEtreme Programming and Scrum (Moniruzzaman & Hossain, 2013). Scrum focuses on project situations where the final outcome may be unknown, making planning difficult, which has lent Scrum to be investigated in business organisations outside the software development industry (Schwaber & Sutherland, 2011; Serrador & Pinto, 2015). Scrum consists of small cross-functional teams who are self-organising in the product development phase while maintaining communication feedback loops allowing the flexibility of reframing and replanning during the project development (Schwaber, 2017). The development increments called "sprints", are initiated with planning and end with a stakeholder review of the solution (Sutherland, Schwaber, Scrum, & Sutherl, 2007). The Scrum framework allows complex problem solving with the scrum team delivering products of the highest value in the shortest time (Schwaber & Sutherland, 2011).

Scrum achieves this efficiency by subscribing to process control theory, asserting that experience creates knowledge and decisions are based on that knowledge (Schwaber, 2017). Schwaber and Sutherland (2017) outlined the three pillars of empirical process control, as transparency, inspection and adaption. In relation to transparency, they highlighted the Scrum process must be visible and defined by common standards to create a common understanding of project work

(Schwaber, 2017). Similarly, when outlining inspection, Schwaber and Sutherland (2017) stated, "Scrum users must frequently inspect Scrum artefacts and progress toward a Sprint Goal to detect undesirable variances" (p.5). The third pillar referred to is adaptation, which is described as an adjustment made to the product when one or more aspects of a process deviate outside the agreed limits (Schwaber, 2017).

Transparency, inspection and adaptation occur in the Scrum process framework, illustrated in Figure 1(below). The framework maintains communication flow via prescribed time-boxed team meetings (Schwaber, 2017). The initial meeting is the "sprint planning" meeting which involves the entire Scrum team who decide what can be delivered in the impending sprint and how will the work be achieved (Schwaber, 2017). A second meeting is a regular face to face meeting which occurs daily during each sprint cycle and is referred to as the "daily stand-up meeting" (Sutherland & Sutherland, 2014).

Figure 1: The Scrum Process
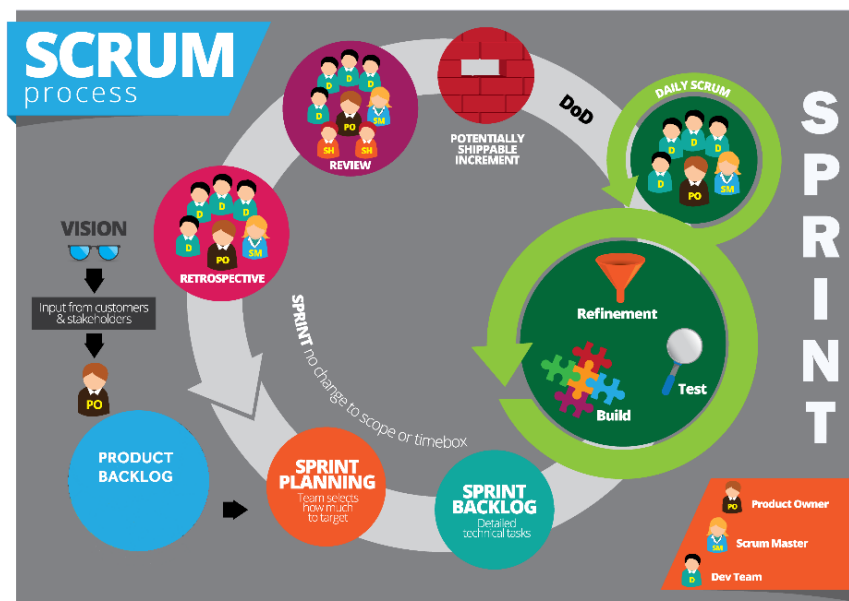
Source: Adapted from (Sutherland et al., 2007, p. 14)

The daily stand-up meeting requires each team member to follow a set pattern to update the team on their project task status including the prior days' work achievement, the current days' work plan, and any barriers which could delay the work (Sutherland & Sutherland, 2014). The daily stand-up meeting is time-boxed to fifteen minutes, occurs at the same time and place each day and is coordinated by the

Scrum master who ensures meetings start and end on time and the meeting rules are followed (Sutherland & Sutherland, 2014). The daily stand-up meeting optimises team communication and collaboration, by inspecting the prior day's completed work with relation to the project goal (Schwaber, 2017). The third meeting in the Scrum framework is the review meeting between the project team and the stakeholders. This review meeting occurs at the conclusion of each sprint cycle, reviewing the developed product and ensuring the product still reflects the desired outcome of the stakeholders and customers (Sutherland & Sutherland, 2014). The fourth Scrum meeting, the "sprint retrospective meeting", involves the entire project team and occurs at the completion of each project sprint (weekly to four weekly cycles), assessing the effectiveness of the Scrum process and team dynamics to look for process improvements (Sutherland & Sutherland, 2014).

Scrum methodology allows the project team to respond to unpredictable environments by embracing rather than rejecting change within the process, promoting rapid response and accelerating project outcomes through the ongoing communication structures (Dyba, 2000; Erickson, Lyytinen, & Siau, 2005; Williams & Cockburn, 2003). In relation to projects in the medical device industry, Walsh (2018) concluded the key for the medical device industry is to "remain nimble and adaptive, and to implement policies, practices and course corrections to navigate the fluidity within the industry" (p.49). Hence the question, does Scrum have a definitive place in the non-ITC industries as a successful project methodology, becomes intriguing.

It would appear in the current complex changing business environment, there exists an opportunity to introduce the Agile Scrum methodology within a medical technology organisation. The Scrum framework could counter the traditional multi-siloed structure to deliver higher value in a short time. However, the effectiveness of Scrum as a project framework outside the software development industry has not been definitively answered. Moe et al (2010) suggested further work focusing on (1) identifying problms which arise form Scrum implementation; and (2) studies on teams involved in short sperints (e.g. 2 – 3 weeks) whch provides the team with more frequent feedback would be useful.

Therefore this study aims to investigate Scrum as a project framework in a medical technology company, for projects in the non-ITC industry, usig short sprints. The study will aim to identify the critical factor of success, including communication tools, modes and frequency associated with project success in the non-ITC industries, whilst also aiming to identify potential problems which may arise when introducing Scrum inot project teams.

1.1   Focus of the Study

This study applied the Agile Scrum methodology to projects in a medical technology organisation, outside of the traditional software development (IT) industry. The purpose of this research was to investigate the application of the Scrum methodology as a project management framework in small cross-functional teams, where project solutions were not software related, utilising short sprint timeframes. More specifically the study investigated the frequency, mode and tools associated with communication and their associated effect on project success as well as identified potential problems arising from the introduction of Scrum.

For the purpose of this study, frequency relates to the regularity of communication within the study framework process; mode refers to the mode of communication, being narrative (verbal) or visualisation (visual); and tools refer to the Scrum framework communication tools of the Scrum meetings and the Scrum board.

Within a large multinational medical technology organisation (TechCo), engagement surveys are taken quarterly to measure employee engagement. A recent 2016 engagement pulse survey of the organisation's Australian employees gave a glimpse into the difficulties of working in a multi siloed organisation. The survey results are required to be confidential and are de-identified for the purpose of this study. There are two statements in the survey which provide an internal view of how organisational systems are working together, "It's easy to work with other groups to get the job done here" and "Getting work done is easy around here" (TechCo, 2016). These two statements scored 58% and 51% affirmative responses in March 2016. A follow-up survey in August 2016 revealed scores of 47% and 35% respectively. Essentially, 53% of the employees surveyed believed it was not easy to work with

other internal groups, and 65% of employees surveyed believed it was not easy to get work done within the organisation (TechCo, 2016).

The organisations survey results lend motivation and opportunity to try a new approach to project management, in this case, the Scrum methodology, bringing people together from different business and functional silos into cross-functional project teams. The researcher, a qualified Scrum master, therefore, applied the Scrum project methodology to existing project opportunities within the organisation.

Hence, this research investigated the application of the Scrum methodology with a group of cross-functional employees across five projects. The researcher investigated the perceptions of project team members in relation to Scrum as a project management framework. The perceptions of the participants were compared to the participant's experiences in previous non-Scrum projects. Therefore the study participants were their own control group.

1.2   Research Question

The purpose of the study is to develop a deeper understanding of participants perceptions and the association between communication and project success. In particular, the research applied a rigorous methodology to investigate the perceptions of individuals within organisational silos working together in small cross-functional project teams about the application of Scrum project management framework. As there is limited empirical literature on the effectiveness of Scrum outside the software development industry, the researcher is interested in providing empirical insights into Scrum model effectiveness in a non-ITC organisational setup.

The research adopts an exploratory research design, primarily qualitative using constructivism as its paradigm. Limited quantitative data was also collected to complement the qualitative results. The responses of the qualitative and quantitative surveys are considered in relation to the following study questions.

A: What are the perceptions of project team members of the Scrum methodology in non-IT industry projects?

B: What are the ideal tools and frequency of meetings to enhance communication in the Scrum project framework?

<u>C</u>: What is the ideal mode of communication to enhance communication in the Scrum project framework?

1.3   The Researcher as a Practitioner

The professional studies program at the University of Southern Queensland introduced the researcher to reflective practice to develop higher skills order and scholarship within the work-based learning pedagogy. The researcher has designed, implemented and executed a work-based study, within the workplace project environment using a practice-based research approach. Hence the researcher in this study is immersed with the phenomenon being observed and can therefore be characterised as an insider researcher (Unluer, 2012).

The researcher brings thirty years of clinical experience in the healthcare system, including both public and private hospitals systems, within Australia and internationally in New Zealand and Saudi Arabia. For much of the thirty years, the researcher has held management positions with local Australian and international responsibilities managing teams of people. The researcher for the past eighteen years has experienced working in large multinational medicinal technology organisations, across Australia and New Zealand, much of which was in management and senior management roles. The experience of the researcher over the past ten years encompassed a high degree of regular interactions, negotiations and development of business outcomes with senior hospital and healthcare executives both locally within the Australian and New Zealand healthcare markets, as well across global organisations including hospital groups in Asia and Europe. The researcher has experience as a member of committees, teams and project teams within healthcare and medical technology organisations. The researcher has presented locally and internationally regarding effective peer to peer processes focussing on account management and business development strategies to create meaningful business relationships with provider and payer organisations.

The breadth and depth of the experience of the researcher in the healthcare and medical technology sector provides the researcher with a uniquely rich understanding of issues and potential opportunities to engage in change across the industry.

2 CHAPTER TWO: Literature Review

A literature review was conducted to investigate Agile and Scrum project management, with a specific interest in Scrum outside of the software development arena. Keywords used included Agile and Scrum in relation to projects, project management, and business.

The literature review was conducted to understand the current research related to the effect communication has on project success, followed by the utilisation of communication tools in projects. A further literature review was undertaken to conceptually frame an individual's accountability in projects and its effect on project success as related to practitioner perceptions.

The purpose of this literature review is threefold. 1) To investigate the application of Agile project management and Scrum project framework outside the software development industry, and to uncover current gaps in the empirical data. 2) To identify project success factors with emphasis on project communication, accountability and project team effectiveness. 3) To identify known project tools and techniques associated with project success to understand their effectiveness associated with project communication and project success.

2.1 Agile Project Management

The software development world took a different stance in the early nineties from traditional command and control project methods, to iterative and incremental strategies (Larman & Basili, 2003). A number of project management methodologies emerged, with the architects collaborating in 2001 to draft the Agile Software Development Manifesto (Beck et al., 2001a). Since then these project management strategies have been referred to as Agile (Beck et al., 2001a; Cohen, Lindvall, & Costa, 2004).

Agile methodology is utilised most commonly in project management of software development and can be referred to as an umbrella methodology. There are several project management frameworks which fit under the Agile project management umbrella, including but not limited to Crystal, Disciplined Agile Delivery, xEtreme Programming, Pragmatic Programming, Feature Driven Development, Adaptive Software Development, Scrum (Azanha et al., 2017;

Moniruzzaman & Hossain, 2013; Serrador & Pinto, 2015). Agile is a methodology which conforms to the values of the Agile Manifesto, seeking to focus on communication and collaboration, a team which can self-organise, the flexibility to adapt quickly to customer feedback and to release functioning incremental software products into the market in the quickest time (Bonassa & Carvalho, 2016).

The architects of Agile recognised that traditional project methods encompassed extensive planning while fixing scope and specified project outcomes prior to development starting (Cohen et al., 2004; Serrador & Pinto, 2015). These traditional methods persisted despite accumulating evidence of resulting rework, time and cost overruns, customer dissatisfaction and lost end product value (Abrahamsson, Salo, Ronkainen, & Warsta, 2017; Cohen et al., 2004; Dybå & Dingsøyr, 2008; Serrador & Pinto, 2015). In contrast to the traditional methods, the Agile developers placed their focus on people rather than processes and on evolutionary, iterative planning rather than on fixed project scope (Cohen et al., 2004; Dybå & Dingsøyr, 2008). The Agile developers also embraced change and participated in regular customer interactions during the product development process (Cohen et al., 2004; Dybå & Dingsøyr, 2008; Serrador & Pinto, 2015).

Figure 2: Agile Project Management Methodology

Source: http://backlinkme.net/agile-project-management-methodology/

Dingsøyr et al. (2012) conducted a literature review to examine current publications and citations of Agile in the software arena, aimed to assess the progress of Agile research in the years between 2001 and 2011. Dingsøyr et al. (2012) identified 1551 research papers related to Agile and software development, from 63 countries. They noted, "the initial spurt of studies on eXtreme programming, the academic community seems to have turned its attention to scrum" (Dingsøyr et al., 2012, p. 1219). Dingsøyr et al. (2012) concluded there is a good foundation for researching Agile and software development and challenged researchers to "embrace a more theory-based approach in the future" (p.1219). Denning (2015) reported the benefits of Agile teams included higher staff engagement and more rapid innovation implementation, with teams exhibiting greater responsiveness to real customer needs and reported improved customer satisfaction. An extensive literature review by Serrador and Pinto (2015) looked at over 1000 multi-industry Agile projects, testing the effect of Agile on project success related to stakeholder satisfaction and project efficacy. Their review suggested both project efficacy and stakeholder satisfaction were positively affected by using Agile methodologies (Serrador & Pinto, 2015). Bonassa et al. (2016) reported research themes related to the soft side of Agile methods are increasing, including organisational change, self-management and teamwork. They completed a literature review of Scrum, finding 91 articles, of which 82% were classified as computer science and 24% engineering, concluding most of the Scrum research related to software development (Bonassa & Carvalho, 2016). Overall, they reported the key advantages of applying Scrum are increased customer satisfaction, reduced associated costs and reduced development time (Bonassa & Carvalho, 2016).

The Scrum framework consists of features that make it an attractive option in project management outside of software development discipline. These include promoting the use of cross-functional teams, short time-frame iterations, ongoing customer collaboration and speed of product or solution development resulting in timely customer responsiveness (Bonassa & Carvalho, 2016; Schwaber, 2017). The short time-frame iterations promote a fail fast or pivot philosophy reducing waste in effort and time (Sutherland & Sutherland, 2014). Scrum encourages a continuous communication loop among team members through the daily stand-up meeting and the Scrum board (sprint backlog), while also having regular meetings to review the

product with stakeholders (Schwaber, Sutherland, & Beedle, 2013). Scrum also promotes continuous improvement of the project management process through the project team retrospective meeting, occurring at the close of each sprint cycle to assess the project team efficiency (Schwaber & Beedle, 2002; Schwaber et al., 2013; Sutherland & Sutherland, 2014).

Scrum was coined by Jeff Sutherland and Ken Schwaber with reference to the rugby scrum, where a team of people work together most effectively to achieve a common goal (Sutherland & Sutherland, 2014). Scrum is a project management framework for developing solutions and products with the aim to continuously improve the product, the team, and the working environment (Schwaber et al., 2013). The Scrum Framework identifies the four values as defined by the Agile manifesto (Table 2), as the cornerstones to project development principles (Beck et al., 2001b).

Table 2: Agile Manifesto Values

1	Individuals and interactions over processes and tools
2	Working software over comprehensive documentation
3	Customer collaboration over contract negotiation
4	Responding to change over following a plan

Source: www.agilemanifesto.org

Using Scrum, the project goal is broken down into small actionable tasks that individual team members can undertake. Hence the Scrum framework allows team members to focus on what can be achieved each day (Schwaber et al., 2013). Scrum structure creates visibility for the entire team, identifying which task is being undertaken at any time, and by whom, allowing the team transparency of tasks completed and tasks yet to be initiated (Layton, 2015; Schwaber et al., 2013).

The Scrum team has three different team members who have specific roles, with each role serving a specific purpose. The Product Owner (PO) is the vision holder and the voice of the customer and considers the effect of the Scrum outcome or product on the customer or stakeholder (Sutherland & Sutherland, 2014). The PO ensures tasks are in scope and blocks out-of-scope tasks from entering the Scrum, to maintain team focus. The PO is not the leader of the Scrum or the project team; there is no project leader in the traditional sense (Schwaber, 2017; Sutherland & Sutherland, 2014).

The second role is the Scrum Master (SM) who facilitates the project. The SM is not a leader and does not tell the project team how to complete project tasks. The SM is responsible for promoting and supporting Scrum as defined in the Scrum Guide by promoting understanding of Scrum theory and practices (Schwaber, 2017; Sutherland & Sutherland, 2014). The SM facilitates the sprint planning meeting, daily stand-up meeting, product review meeting and the sprint retrospective meeting. The SM helps remove any barriers the development team members identify as impeding their progress (Sutherland & Sutherland, 2014).

The third role is the Development Team (DT) member. The DT members take on the actionable tasks in the sprint backlog to build out the product or solution (Sutherland & Sutherland, 2014). The DT decide how they will complete the tasks, the DT is autonomous and self-regulating (Schwaber, 2017). The DT ideally consists of up to seven people, remaining small enough to be nimble yet large enough to have the combined skills to complete the actionable tasks. Ideally, DT members should have complementary skills rather than the same skills (Schwaber, 2017; Sutherland & Sutherland, 2014).

The Scrum framework consists of rules of practice. Each component within the framework serves a specific purpose and is essential to Scrum's success and usage. These Scrum rules bind together the roles, events, and artefacts, governing the relationships and interaction between each (Schwaber et al., 2013).

Sutherland and Schwaber's (2013; 2014) rules of Scrum are outlined below and illustrated in the Scrum Software Development Process (Figure 3 p.16).

1. Defining a current state and future state.
2. Creating a future state vision statement to guide the project.
3. Identifying skill set most likely to achieve future state, hence build a team around the vision.
4. Agreeing on Definition of Done which decides when the work is finished.
5. Listing all actions reasonable to reach the future state, the Product Backlog.
6. Identifying the highest value action and rearranging the Product Backlog list with the highest value item at the top.
7. Building a task list to be able to complete highest value action, the Sprint Backlog.

8. Sprint: one to four weekly cycles to complete the Sprint Backlog task list.
9.   Sprint Backlog chart or Scrum Board displays the sprint tasks.
10. Daily Stand Up, a 10-15 min time-boxed meeting for the team to update each other on progress.
11. End of Sprint review meeting to check product/solution still on track with stakeholders/customers.
12. End of Sprint retrospective meeting with the entire project team to reflect on the Scrum process to identify efficiency gains in the next sprint.

Figure 3. Scrum Software Development Process

Source: https://www.maxxor.com/software-development-process
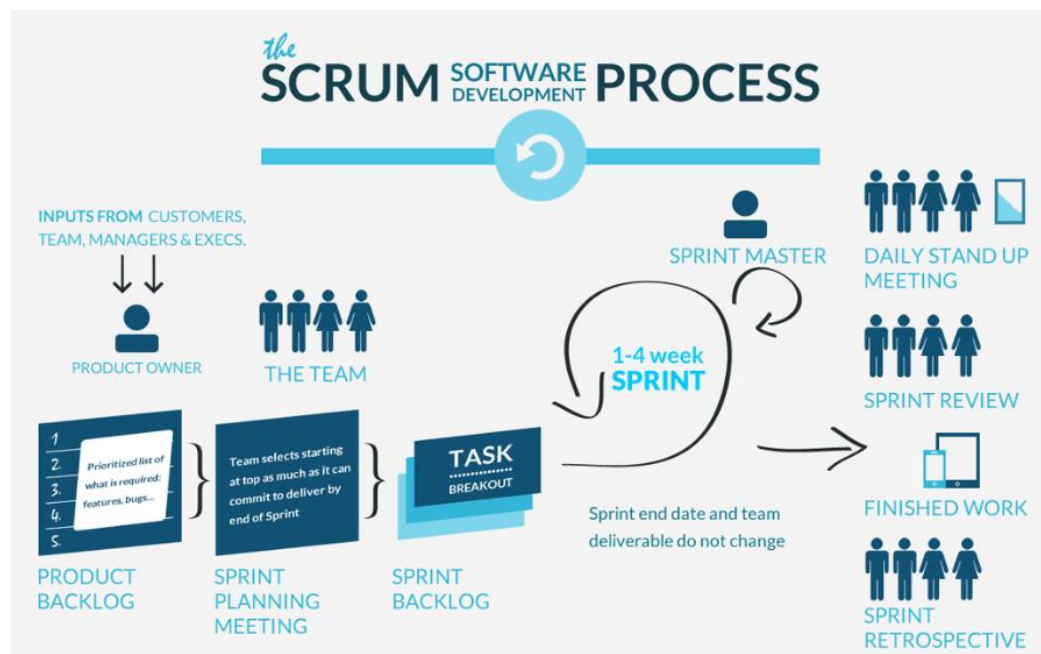
A more detailed description of each of the twelve rules is described below.

 (1) Understanding the current state position and the customer/stakeholders desired future state position allows the Product Owner to clearly understand what the goal of the project is (Schwaber et al., 2013).

(2) The Project Owner articulates the customers desired future state into a vision statement. The vision statement will be shared with the Development Team for input and refinement. Vision statement refinement allows the Development Team to own the future state vision of the project, (the goal). The vision is regularly shared

throughout the scrum, reinforcing the overall goal as well as maintaining "in scope" practices during the project timeline (Schwaber et al., 2013).

(3) Once the future state vision statement is known, and hence the project artefact understood, the product owner is then able to accumulate the right team of skills to best achieve the future state product. It is optimal to have a team with a balanced set of skills. A balanced skill set allows the Scrum Team to be able to deal with the ever-changing challenges and can act as an autonomous team. Hence the team is built around and after the future state vision is defined (Schwaber et al., 2013).

(4) Agreeing on "Definition of Done" which decides when the work is finished. Everyone on the project team must understand what "Done" means, so they know when to stop developing. Done helps to define what is in scope or out of scope. Each project and each task within a project should have a definition of done. Having a shared understanding of when work is complete ensures transparency. "Definition of Done" will vary significantly for each Scrum project (Schwaber, 2017).

(5) The Product Backlog is a list of work required to produce the product. The PO with the help of the DT creates the product backlog. Each product backlog task must have value to the customer/stakeholder future state. Hence each artefact in the product backlog is designed around a "user story." Simply put the user story is a value statement relating the product to the end user, a stakeholder of the final product. The collaborative maintenance of the Product Backlog helps to clarify the project requirements and creates ownership among the Scrum Team. The Product Backlog may be dynamic, evolving as the product develops and is continuously reviewed. The PO is responsible for maintaining the product backlog content, ensuring the DT remains in scope (Schwaber et al., 2013).

(6) The Product Backlog is ordered and prioritised with the highest value item (user story) on the top to the lowest value item on the bottom. The PO and the DT collectively engage in the prioritising process; however, the final responsibility lies with the PO, who answers to the customer/stakeholders. This highest value priority will be the first project undertaken by the development team in the first sprint cycle (Schwaber et al., 2013).

(7) The highest priority requirement (user story) is broken down into the smallest actionable tasks possible and placed in the "Sprint Backlog". This task list is a backlog of actionable tasks each of the development team members will pick and complete during a sprint cycle (Schwaber et al., 2013).

(8) A Sprint is the time frame the DT works on tasks. Typically, the Sprint is one to four-week cycles. During the Sprint, the DT burn through the actionable tasks in the Sprint Backlog. As the actionable tasks are completed, they are updated on the Scrum Board (Schwaber et al., 2013).

(9) The Scrum Board (sprint backlog chart) is a visual aid that identifies the tasks being currently undertaken in the Sprint Backlog. The Scrum Board shows user stories "Stories," tasks yet to be started "To Do," tasks currently being undertaken "Doing," barriers to task progress "Barrier" and completed tasks "Done" (see Figure 4. below). The Scrum board should be in a visible area of the workspace of the DT. The scrum board is updated daily or multiple times a day. Ideally, the daily stand-up occurs in front of the Scrum Board (Schwaber et al., 2013).

Figure 4. The Scrum Board
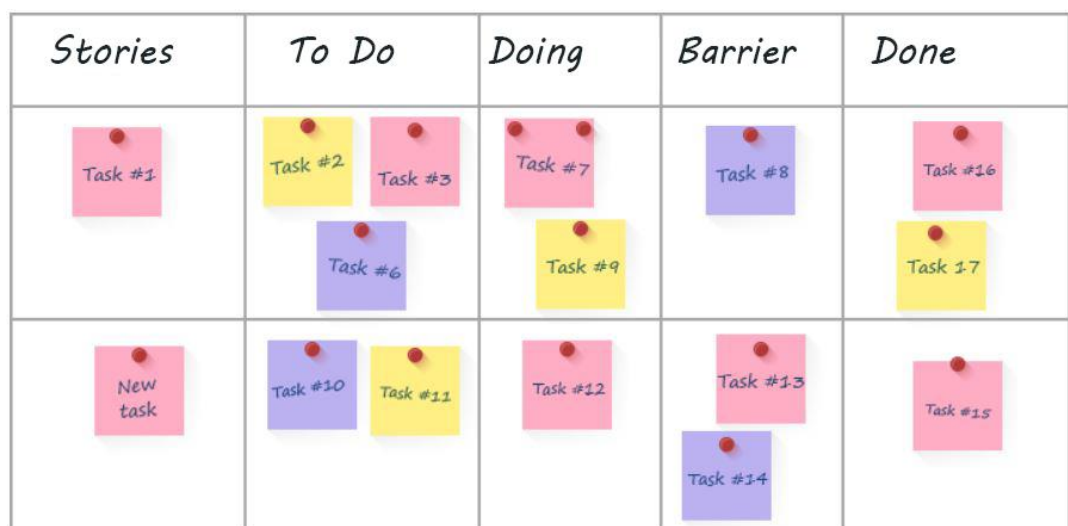
Source: Adapted from XBsoftware, https://xbsoftware.com/blog/software-development-life-cycle-sdlc-scrum-step-step/

(10) The Daily Stand-up is the daily meeting where the Scrum project team gathers to provide project status updates. The Daily Stand-up is a ten to fifteen-minute time-boxed meeting which creates transparency of progress, reviewing what has been

done, what needs to be done, and where there are issues. The SM facilitates the daily stand-up meeting by asking each DT member three questions; (1) What did you do yesterday to advance the project? (2) What will you do today to advance the project? (3) What barrier is in your way to advancing the project? (Sutherland & Sutherland, 2014).

There are also guiding rules around the daily stand-up meeting. The meeting starts on time, irrespective of who in attendance, or not in attendance, or late. Each development team member is asked the three questions and given the opportunity to answer the three questions uninterrupted. DT members should be prepared for the three questions. There is no problem solving during the meeting. Any barriers to progress are discussed after the meeting with the SM and the PO. Standing up during meetings is encouraged as they are too short to sit. Only the SM team members should be speaking during the daily stand-up meeting. While stakeholders are able to attend daily stand-up meetings, any issues they have should be taken up with the SM after the meeting is adjourned. The meeting should not be allowed to enter into problem-solving discussions or have new artefacts discussed. Allowing interruptions from stakeholders almost guarantees that the meeting gets off topic and runs much longer than necessary. Allowing only the SM to facilitate the meeting and the DT members to answer the three questions uninterrupted, will create an efficient exchange of information. Finish the meeting within the allotted time (Gupta, 2014; Schwaber et al., 2013).

(11) The Sprint Review meeting. During the Sprint Review meeting, the Scrum team and stakeholders collaborate on what was completed (the product to date), in the Sprint. They consider the current state of the product, which can either go out to market or alternatively, consider the next things that could be done to optimise the product value. This meeting is informal, not a status meeting, and the presentation of the product progress is intended to elicit feedback and foster collaboration (Schwaber et al., 2013; Scrum.org, 2018).

(12) The Sprint Retrospective meeting. In this meeting, team members reflect on the past Sprint to check three things. What went well during the sprint, what didn't go well and what improvements could be made for the next sprint. The meeting is typically time-boxed (e.g. 3 hours). The Sprint Retrospective meeting is an integral

part of the "inspect and adapt" process. The meeting allows the team an opportunity to improve their overall output, providing actionable suggestions to improve performance for the next sprint. Typically the retrospective meeting would aim to inspect the last Sprint in relation to people, relationships, process, and tools. Secondly to identify improvements to implement in subsequent sprints (Schwaber et al., 2013; Schwaber, 2017; Scrum-Institute.org, 2018).

The literature suggests there are benefits to employing Agile methodologies, including higher staff engagement, improved customer and stakeholder satisfaction, greater responsiveness to customer needs, reduced costs and reduced development time (Bonassa & Carvalho, 2016; Denning, 2015; Serrador & Pinto, 2015). What is not apparent in the literature thus far is the application of Agile and Scrum outside the software development industry, and if these noted benefits will transfer across to projects outside the IT industry.

For the purpose of this study, Agile refers to the group of methodologies which subscribe to the Agile Manifesto, which formally proclaims four key values and twelve principles to guide an iterative and people-centric approach to software development (Beck et al., 2001b). The Agile methodologies include but not limited to Crystal, Disciplined Agile Delivery, xEtreme Programming, Pragmatic Programming, Feature Driven Development, Adaptive Software Development, Scrum (Azanha et al., 2017; Moniruzzaman & Hossain, 2013; Serrador & Pinto, 2015).

For the purpose of this study, Scrum project management comes under the broader umbrella of Agile project management, provides a process framework that embraces iterative and incremental practices, via a series of iterations called sprints. At the completion of each sprint, the team produces a potentially deliverable product increment. For the purpose of this study, the Sprint Backlog chart is referred to as "the Scrum Board."

2.2   Agile and Scrum Project Management outside Software Development

A further literature review investigated Agile methodologies that have made the transition away from the IT software development arena. Pope-Ruark (2015) stated, "Agile is not only popular in software development; a quick Google search reveals its reach in design, marketing, publishing, energy management, financial

services, and civil and mechanical engineering, to name a few," (p.116). Despite the popularity of Scrum, prior to 2006, no empirical case studies were identified in literature outside software development (Dybå & Dingsøyr, 2008; Moe et al., 2010).

Gustavsson (2016) also completed a literature review finding there are few empirical studies of Agile project management outside of software development. Gustavsson's (2016) review aimed to identify benefits to projects adopting Agile methods in non-software development contexts since 2001 when the Agile Manifesto was created and succeeded in finding 16 articles with a total of 21 case studies; all post 2006. The Scrum framework, or parts thereof, were utilised in 14 of the case studies. The context of the application of Scrum was across manufacturing (5), strategic management (3), higher education course design (2), supply chain (1), non-profit change project (1), public relations (1), and simulation modelling (1). Gustavsson (2016) collated and reported the benefits from the case studies in Table 3.

Table 3. Reported Benefits from the Case Studies

Number of occurrences	#	Reported benefits
11	1	Better collaboration in the team
9	2	Increased customer interaction
8	3	Increased productivity and speed
7	4	Increased flexibility , coping with change
6	5	Better understanding of goals/tasks/requirements
6	6	Increased transparency and visibility
5	7	Increased quality
5	8	Customer-centered value-add priority process
4	9	Increased knowledge sharing
3	10	Increased cross-organizational collaboration
3	11	Better focus
2	12	Impediment removal process
2	13	Increased individual autonomy
2	14	Decreased customer complaints
2	15	Increased motivation
1	16	Clear sense of progress
1	17	Improved resource allocation

Source: Gustavsson, 2016, P.7

The top three benefits listed as (1) better collaboration in the team (2) increased customer interaction, and (3) increased productivity and speed. Gustavsson (2016) concluded that "the findings are interesting for further research since they imply that the first value of the Agile Manifesto could have the largest impact on benefits in Agile applications in non-software development contexts" (p.9).

Some of the studies Gustavsson (2016) refers to are examples of Scrum being used in manufacturing, including Pharmaceuticals, Toys, Electronics, Windows and Power. Gustavsson (2016) noted there were very few challenges in implementing Agile methodologies and noted in his conclusion this too is an area of further research. Sommer et al. (2015) applied Agile process to manufacturing physical products and incorporated some Scrum tools including sprints, the Scrum Board (sprint backlog tracker), and product backlogs to create a hybrid stage-gate method. Sommer et al. (2015) identified the benefits of this hybrid approach as better integration with the customer creating a faster adaptive response to customer needs. They identified an improvement in the development speed, in team communication and overall the product was faster to market (Sommer, Hedegaard, Dukovska-Popovska, & Steger-Jensen, 2015). While these initial findings were promising , the researchers concluded further research was required (Sommer et al., 2015).

Further reviews give more empirical data on the use of Agile methodologies. Hummel (2014) completed a literature review to validate, update and extend previous reviews regarding the general state of research on Agile information system development (ISD). Hummel (2014) concluded further qualitative research is required, specifically focusing on the implications of Agile ISD for coordination, collaboration and communication mechanisms within Agile teams and what is the impact of Agile practices on the organisational culture. Conforto et al. (2014) surveyed 19 companies from a variety of industries and concluded that these companies were facing challenges using current project management practices. Furthermore, they identified the presence of some Agile project management enablers indicating an opportunity to adopt Agile project management in non-software development companies, though temper challenges exist in large complex traditional industries (Conforto et al., 2014). They remarked further research was required to consider the development of hybrid management models, utilising both agile and traditional approaches (Conforto et al., 2014).

Serrador and Pinto (2015) investigated if Agile project management positively impacted project success. They stated: "Agile Methods have a direct impact on project success, as evaluated by efficiency, stakeholder satisfaction, and the success of meeting wider business goals" (p.1043). They noted in their investigation the degree of Agile/iterative practices used in projects and were able to correlate a higher

reported project success with a higher degree of Agile/iterative approach (Serrador & Pinto, 2015). They also reported Agile methodologies correlated with higher overall project success, project efficiency, and stakeholder success (Serrador & Pinto, 2015). Interestingly Serrador and Pinto (2015) reported the project vision/goal quality were significant to project success, while project complexity and the experience of the team were not significant to project success.

What is noted in the study by Serrador and Pinto (2015) only 6% of the projects reported on were classified as completely or nearly completely Agile. Also of note, the individual Agile methodologies were not reported. Hence there is no reference to the breakdown or number of projects, if any, which related to Scrum. Despite reporting on Agile outside of the IT industry, no distinction is made if the projects were related to IT and software development, although there is a hint in the discussion the projects may have been associated with IT and software from the following quote,

" though it [Agile] has been adopted in multiple industries and across national borders, our findings suggest that it has achieved best success to date within certain settings; notably, high technology, healthcare, and professional service. All of which are heavy users of software and IT" (Serrador & Pinto, 2015, p. 1050).

Serrador and Pinto (2015) concluded by suggesting further investigation would be useful to "determine the ongoing diffusion rate of Agile given its record of success."

It is noted the literature relating to Agile outside of the software development world is limited, while the empirical literature relating to Scrum is even more elusive. Interestingly many of the reviewed authors recommended that further research is warranted, including focusing on the implications of coordination, collaboration and communication mechanisms within Agile teams (Hummel, 2014); how factors such as visualization techniques and communication and knowledge sharing produced the noted positive performance effects (Sommer et al., 2015); and individuals' interactions in non-software development contexts (Gustavsson, 2016).

The above literature highlights when Agile is used outside the software development industry, there are benefits which translate with the methodology.

Namely, better integration with customer needs, improved development speed, faster product delivery to market and improved team communication (Dybå & Dingsøyr, 2008; Gustavsson, 2016; Hummel, 2014; Serrador & Pinto, 2015; Sommer et al., 2015).

In light of these reported benefits, it is useful to investigate the literature relating to project success factors in non-Agile projects to assess for correlation with Agile project success factors.

2.3 Project Success Factors

A project involves a group or team of people working together with complementary skills, shared responsibilities and resources to achieve a common purpose and performance goal (Ajmal, Helo, & Kekäle, 2010; Katzenbach & Smith, 1993). Originating in the engineering discipline, project management is now a dominant model for strategy implementation, continuous improvement and new product development for organisations within fields including construction, software development, information systems, research and development (Joslin & Müller, 2016; Jugdev & Müller, 2005; Shi, 2011). A more recent focus on project management in all facets of business has created an expanded contextual nature of success for projects and stakeholders (Daspit et al., 2013a; Serrador & Pinto, 2015; Winter, Andersen, Elvin, & Levene, 2006).

Along with the increased focus on projects, Fortune et al. (2011) reported a significant increase in the use of project management methodologies, with 72% of respondents using a project management methodology in 2002, increasing to 92% using a project management methodology in 2011. Of note, the average number of project management tools used per respondent in the 2011 survey was 10.37, double the number of tools respondents used in 2002 (Fortune et al., 2011). Fortune et al. (2011) surveyed individuals involved in projects, representing the results of project success and failure graphically (Figure 5, p.25). In Figure 5 on he x scale, 1 represents project success, and 7 represents project failure (Fortune et al., 2011). They found overall only sixteen percent of the 149 projects were judged a complete success, while one project was deemed a complete failure (Fortune et al., 2011).

Figure 5. Project Success
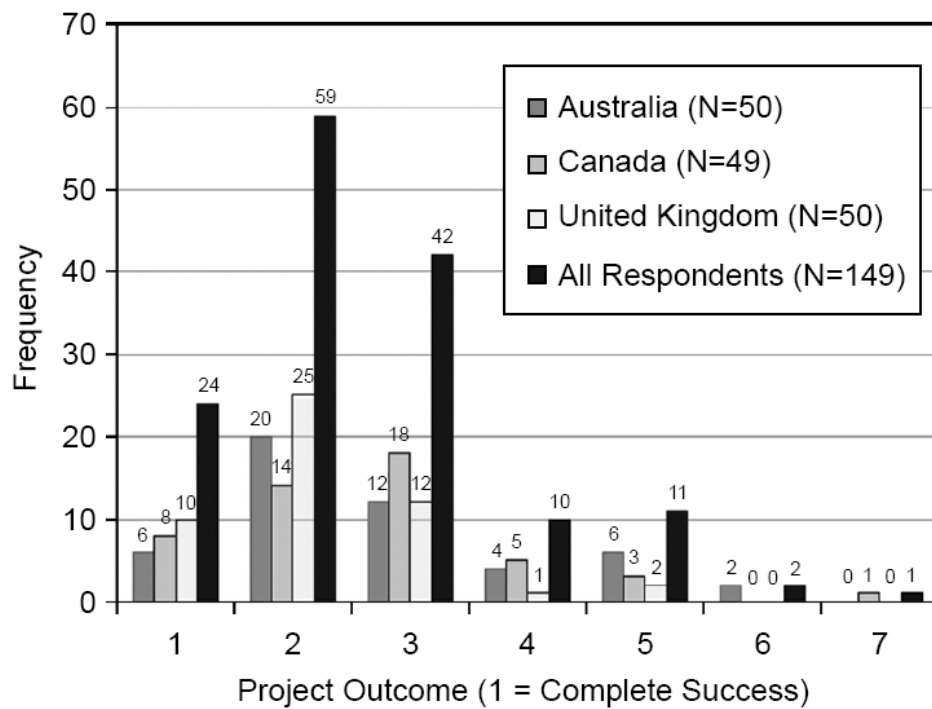
Source: White and Fortune, 2011, P.559

Despite the increased utilisation of project management, subsequent project management tools, the increasing utilisation of projects and prevalence of project teams, studies continue to identify a high rate of project failure (Davis, 2014; GROUP, 2011; Mir & Pinnington, 2014). Project failures were also recognised by Winter and Szczepanek (2008) who stated,

whilst different industry surveys continue to highlight the familiar problems of product quality, missed deadlines and budget overruns, the same surveys also highlight the need for a more strategic approach towards the management of projects and a greater focus on the value and benefits that projects and programmes contribute to organizations (p.1).

It is unsurprising, therefore, that project performance, project success and debate on the factors which lead to project success continue to be investigated despite over fifty years of research (Albert et al., 2017; Kozlowski, 2015). Within the organisation in this study, the prevalence of internal and external customer complaints of "being difficult to do business with" led this researcher to investigate a different approach, the Agile Scrum methodology.

The traditional view of project success is the project meets the three factors of the "iron triangle"; schedule (on time), cost (in the budget) and specification (quality) (Belassi & Tukel, 1996; De Wit, 1988; Qureshi, Warraich, & Hijazi, 2009; Toor & Ogunlana, 2010). The iron triangle has been referred to as the success factors which the stakeholders and project manager would use to measure success, rather than the customer or recipient of the project outcome or product (Toor & Ogunlana, 2010). The three tenants of the iron triangle continue to be important objective measurements of project success, particularly in construction, engineering and information technology industries, likely because the outcomes are measurable and tangible (Baccarini, 1999; Ika, 2009). However, since the 1980s, a number of authors have suggested the iron triangle has limited scope with some projects meeting the three criteria yet retrospectively being regarded as a failure, while other projects which fail the three iron triangle criteria could be regarded a success at a future date. (Baccarini, 1999; Ika, 2009; Wateridge, 1998).

Consequently, further studies sought to define the factors of success, referred to as critical success factors (Guvenis, Grobler, Coyle, Sanvido, & Parfitt, 1992; Pinto & Prescott, 1988; Pinto & Slevin, 1987). Guvenis et al. (1992) made the distinction that success could be viewed differently by particular project participants, however, there may be common criteria which are critical to project success. The critical success factors have been referred to as "those factors predicting success of projects" (Guvenis et al., 1992, p. 97). Muller and Jugdev (2012) described critical success factors as the project elements which increase the likelihood of success. In their review of literature spanning the prior four decades, Muller and Jugdev (2012, p. 764) distinguished four dimensions of success factors from a project managers perspective, (1) project efficiency; (2) impact on customers; (3) business success; and (4) strategic potential.

Coinciding with the increasing array of critical success factors was a more robust perspective from a broader group of project stakeholders on the requirements to manage projects successfully (Jugdev & Müller, 2005; Pinto & Mantel, 1990; Shenhar, Dvir, Levy, & Maltz, 2001; Shenhar, Levy, & Dvir, 1997). Several authors further suggested the efficiency of project management and the effective project team functioning, are important factors to consider in project success (Baccarini, 1999; Shenhar & Dvir, 2007; Toor & Ogunlana, 2010). Sala et al. (2005) suggested a more

holistic approach should consider team effectiveness by taking into account the processes and interactions within the team to achieve the outcomes.

Communication has been referenced in the literature relating to critical success factors for projects. Research by Pinto and Selvin (1987) identified key success factors and a framework for the relationship between these factors. These factors are; Project Mission, Top Management Support, Project Schedule/Plan, Client Consultation, Personnel, Technical Tasks, Client Acceptance, Monitoring and Feedback, Trouble Shooting and Communication (Pinto & Slevin, 1987). Pinto and Selvin (1987) placed communication at the top of the framework with direct linkages to seven other key success factors and suggested these linkages represent information flows, rather than causal relationships, (see Figure 6, below).

This is further corroborated by Pinto and Mantel (1990) who referred to communication as "The provision of an appropriate network and necessary date to all key actors in the project implementation". What is not apparent from Pinto and Selvin's (1987) or Pinto and Mantel's (1990) papers, however, are insights into the communication tools and techniques utilised, nor the frequency with which the communication was carried out.

Figure 6. Ten Key Factors of the Project Implementation Profile.
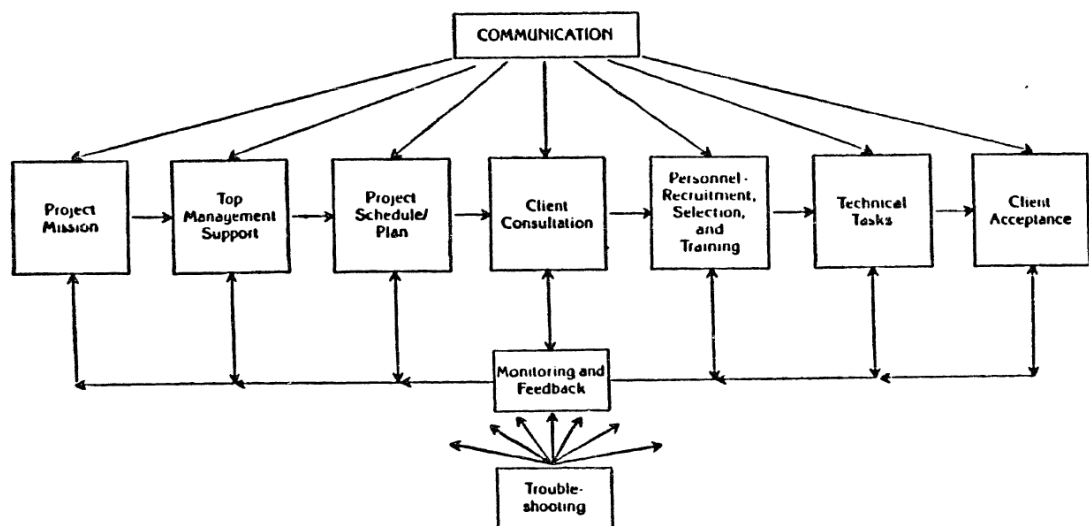
Source: Pinto and Mantel, 1990, p.270.

Researchers have continued to investigate critical success factors; interestingly there are some highly cited papers referring to project success factors, where reference to and discussion on communication remains elusive. Examples include Shenhar (2001; 1997), Cooke-Davies (2002), Muller and Turner (2007), Qureshi, et al. (2009), Muller and Jugdev (2012).

There is a substantial body of literature however which does refer to communication as critical to the success of projects; it is reviewed below. The relevance of communication as a critical factor in project success has great significance in this study as. one of the common themes identified in the retrospective meetings in this study was communication.

2.4   The effect of communication on project success

Communication is the most commonly regarded strategy to support tasks and maintain coordination in teams, with explicit communication strategies viewed as a primary enabler to teamwork success (Kozlowski & Ilgen, 2006; Morgan Jr, Salas, & Glickman, 1993; Zaccaro, Rittman, & Marks, 2001). Salas et al. (2008) referred to communication as, "a central mechanism of information processing" (p.541). Mishra et al. (2011) stated: "Communication in project teams has been found as the most critical success factor in project-based enterprises" (p.356). Similarly, Paquette et al. (2016) stated "effective communication is a vital factor in predicting successful project delivery" (p.31). It is, therefore, a key premise of the study that communication is a critical indicator of success.

The importance of communication for project success was investigated by Pinto and Prescott (1988) who identified client consultation, communication, listening and feedback are critical during a project's conceptual, execution and termination stages. However, Pinto and Mantel (1990) did not identify specific communication techniques and tools for communication and project success. Belassi (1996) referred to Hughes' (1986) survey which concluded that projects fail because of three basic managerial principals: (1) lack of management system, (2) rewarding the wrong actions, and (3) a lack of communication goals. Belassi (1996) compiled a list of seven articles from 1971 to 1989. When critical success factors were compared, communication was only found to be relevant in four articles (Belassi & Tukel, 1996). Belassi (1996) created a connection model of success factors and

placed "Effective Coordination and Communication" in a central box (p.144). However, there is no further information to identify the mode or frequency of communication relating to project success or failure (Belassi & Tukel, 1996).

Henderson (2004) observed that while many studies confirm the overall value of communication in project management, there is limited explicit information about how this value might operate. Mesmer-Magnus and DeChurch (2009) reviewed information sharing and team performance, noting the early work of Stasser and Titus (1987) who indicated that groups spend more time discussing information which is already known, rather than unique information that could progress the group. The results confirm that clear drivers of team performance include information sharing processes (Mesmer-Magnus & DeChurch, 2009). Mesmer-Magnus and DeChurch (2010) surmised there is a recognised need for future research to explore how information is effectively shared within and across project teams.

More recently, White and Fortune (2002) surveyed project managers to identify critical factors for project outcomes. Of twenty-four factors, project managers ranked the importance of "Clear Communication Channels" sixth and ranked "Effective Monitoring and Feedback" eighth. (Table 4 p.30). Of interest, the top critical success factor for project outcomes identified by White and Fortune (2002) was "clear goals" which would require clear communication transmission and mode. Despite this highlighting of communication and effective monitoring, there is no further discussion or explanation on factors related to communication frequency, modality or communication tools.

Similarly, in a literature review by Kate Davis (2014, p. 197) cooperation, collaboration, consultation and communication ranked as the number one success factor among the five stakeholder groups (Table 5, p.30). However, Davis (2014) did not discuss the communication modes, communication tools, or the frequency of communication.

Davis (2014) did suggest further research is required to identify how and why the selected factors are perceived as important by each stakeholder group.

Table 4. Factors critical to the projects outcome – frequency of mention.

Factors	Count
Clear goals/objectives	206
Realistic schedule	185
Support from senior management	176
Adequate funds/resources	164
End user commitment	159
Clear communication channels	144
Effective leadership/conflict resolution	138
Effective monitoring and feedback	135
Flexible approach to change	133
Taking account of past experience	121
Recognising complexity	121
Taking account of external influences	120
Effective team building/motivation	117
Effective management of risk	117
Training provision	98
Contextual awareness	94
Provision of planning and control systems	88
Appreciating the effect of human error	53
Considering multiple views of project	47
Having access to innovative/talented people	8
Other factor(s)	7
Having relevant past experience	3
Support from stakeholder(s)/champion(s)	3
Having a clear project boundary	2

Source: White and Fortune, 2002, p.6.

Furthermore, Davis (2016) referred to the effectiveness of communication between the project recipient stakeholder groups and the project core team, conceding there is limited research examining how communication is conducted and suggests a gap in the literature in this space.

Table 5: Analysis of success factors across stakeholder groups

Success factor theme	Project manager	Client	Sponsor	Owner	Executive	User etc.	Project team
1. Cooperation/collaboration/consultation/communication	1	1			1	1	1
2. Time	1	1	1			1	
3. Identifying/agreeing objectives/mission	1				1		1
4. Stakeholder satisfaction (quality)	1	1				1	
5. Makes use of finished product/acceptance		1				1	1
6. Cost/budget	1	1				1	
7. A project manager competencies and focus	1		1				
8. The project delivering the strategic benefits	1		1				
9. Top management support/executive commitment	1				1		

Source: Davis, 2014, p.197.

Similarly, Lindhard and Larsen (2016) identified responses from owners, contractors and consultants involved with construction projects. They identified five

top factors, with communication ranked as the most important factor relating to project success (Lindhard & Larsen, 2016). Lindhard et al. (2016) identified communication and sharing of experiences improved collaboration and reduced the risk of failure, conversely, a lack of communication sharing led to dysfunction. They concluded more investment in knowledge sharing and communication is required (Lindhard & Larsen, 2016).

Communication has also been identified as a key process in teamwork (Kozlowski, 2015; Kozlowski & Bell, 2003; Salas, Stagl, & Burke, 2004). Conversely, failures in communication have reported negative impacts on team performance and effectiveness (Katz, 1982; Sarin & O'Connor, 2009; Söderlund, 2011; Stout, Cannon-Bowers, Salas, & Milanovich, 1999). Frequent and open team communication can increase cohesion and facilitate role clarity and superior performance (Keller, 1986). This is consistent with findings of Kaplan (1995), who identified project clarity enhanced team cohesion to increase team collaboration.

A number of researchers conclude that a strong predictor of project outcomes is the amount of communication among project team members (Ammeter & Dukerich, 2002; Chiocchio, Grenier, O'Neill, Savaria, & Willms, 2012; Ziek & Anderson, 2015). However, Kaplan (1995) also noted a meeting in itself does not automatically predict task performance. Similarly, Maltz (2004) questioned the frequency of cross-functional communication compared to the quality of information being communicated. Communication quality according to Sarin (2009) should include "accuracy, clarity, detail, relevance, and timeliness" (p.191). In reviewing the literature Sarin (2009) indicated formal, rather than informal communication might be more timely, accurate and detailed. Ultimately, a combination of frequent and good quality communication may produce the most effective outcomes (William Dow & Taylor, 2010).

While the literature reviewed thus far have established communication is a critical factor for project success, communication frequency, mode and tools have been hinted at without providing identified specifics.

2.5   Communication frequency, mode and tools.

2.5.1   Communication frequency.

The role of communication in teams was recognised by Cooper (1996), who found that high-quality teams communicated well and often, used short weekly meetings to maintain project team visibility. In a review of the communication of IT managers, Muller (2003) identified communication frequency (number of communication events), content (the information exchanged) and media (the way a message is relayed) as important attributes of successful communication. Muller's (2003) findings indicated project managers should focus on stable communication with clearly understood methodologies and good relational norms. Ammeter and Dukerich (2002) identified similar outcomes when investigating communication in their survey of projects teams in the engineering and construction environment. The authors concluded the regularity of meetings positively impacted how well a team accomplished its goals (Anantatmula, 2010). This is corroborated by research which identified that project managers should establish communication processes which facilitate transparent, formal and consistent communication (Anantatmula, 2010).

Pinto and Selvin (1987) indicated sufficient communication channels should ensure adequate information exists about factors including the project objectives, status and changes, as well as organisational coordination and the client's needs. While they did not indicate ideal communication frequency, the identification of communication quality parameters included (1) Clearly Defined Goals, (2) Competent Project Manager, (3) Top Management Support, (4) Competent project team members, (5) Sufficient resource allocation, (6) Adequate communication Channels, (7) Control Mechanisms, (8) Feedback Capabilities and (9) Responsiveness to Clients (Pinto & Slevin, 1987).

New Product Development (NPD) team literature investigates the communication frequency and tools for project teams. Ancona and Caldwell (1992) indicated NPD team performance is associated with a higher communication frequency. Moreover, Maltz (2000) indicated communication frequency in itself leads to communication quality.

Janssen (2006) noted a more effective outcome ensues when teams have regular meetings to exchange information, allowing team members to more

comprehensively process information. Cervone (2004) advised these meetings should focus on decisions or action items rather than status reports, to ensure engagement is maintained. Turner and Muller (2004) identified three structures of communication to achieve the best results, (1) balancing formal and informal communication, (2) regular face to face meetings, either daily or weekly and (3) analyse performance by providing quantitative data to stakeholders and customer. Establishing a pattern of communication from the project outset can improve team communication quality and build trust among team members (Frank Cervone, 2014; Henderson, Stackman, & Lindekilde, 2016). Cervone (2014) suggested regular meetings can establish a consistent mechanism for updating all project management parties. Henderson (2016) developed an emerging model for creating and sustaining global project teams, outlining a pattern of communication throughout the project. Henderson (2016) concluded, "effective communication norms help establish and sustain role clarity alignment and interpersonal trust" (p.1729).

What is apparent in the literature reviewed is the frequency of communication is important for project success; however the measurement of that frequency is yet to be determined.

2.5.2   Communication mode.

Communication mode refers to the method or manner of communication transmission which has been employed (Graff & Clark, 2018; Ocker, Fjermestad, Hiltz, & Johnson, 1998). Examples of communication modes include narrative and data visualisation (Graff & Clark, 2018; Zurlo & Cautela, 2014). Narrative communication can be face to face or computer-mediated which can be online synchronous communication, for example, real-time chat (Srivastava & Jain, 2017; Straus, Parker, & Bruce, 2011) or online asynchronous communication such as email (Srivastava & Jain, 2017; Straus et al., 2011).

The communication mode of visualisation has been described as the graphic representation of data, information and knowledge (Eppler & Platts, 2009). Eppler and Platts (2009) suggest visualisation communication benefits the planning and implementation phases, by assisting the sequencing and interdependencies of goal steps and allowing visual task progress in real-time. Graff (2018) suggests learning is

enhanced through narratives by providing context to knowledge, complemented by visualisations which illustrate the important information.

Leadership ability to communicate this important information as a collective mission and project processes has been associated with successful teams (Hardaker & Ward, 1987). Bolman et al. (1992) indicated that recurring communication patterns are enhanced with structure and suggested that clearly stated goals and explicit task descriptions are associated with successful teams. Conversely, communication breakdown and dysfunction can be the result of a lack of structure concerning team objectives and daily activities (Porter & Lilly, 1996). Sarin (2009) noted communication quality is important for improving communication, stating "communication quality can be measured in terms of its accuracy, clarity, detail, relevance and timeliness" (p.191).

The teamwork literature outlines further factors for successful communication. Specifically, teams with a shared understanding of team goals, tasks and coordination, display evidence of a "shared mental model" which leads to more effective team communication and improved teamwork behaviours (Salas, 2005). In contrast, without this framework of shared understanding, team members may aim for different goals (Salas, Stagl, Burke, & Goodwin, 2007). Zaccaro (2001) suggested a shared mental model promotes a framework of common understanding and action, leading to project goal attainment.

The above-reviewed literature on communication mode and frequency indicates that researchers agree frequent communication and quality communication are predictors of project success. The following section will investigate literature which identifies the tools utilised to facilitate communication in projects.

2.5.3   Communication tools.

Project managers who develop communication competencies in written, verbal and nonverbal messages, and use tools such as displaying task performance, can positively influence the productivity of the project team (Gutwin & Greenberg, 2001; Henderson, 2004; Stagl et al., 2007; Zulch, 2014).

A small number of specific communication tools beyond the narrative communication meetings were identified in the literature. Eppler and Sukowski

(2000) explored strategies to improve effectiveness in team knowledge transfer, referencing a visualisation tool which they refer to as a Flight Plan (Figure 7). The Flight Plan is a physical chart used to update the progress of all team member activities.

Figure 7. Sample Flight Plan
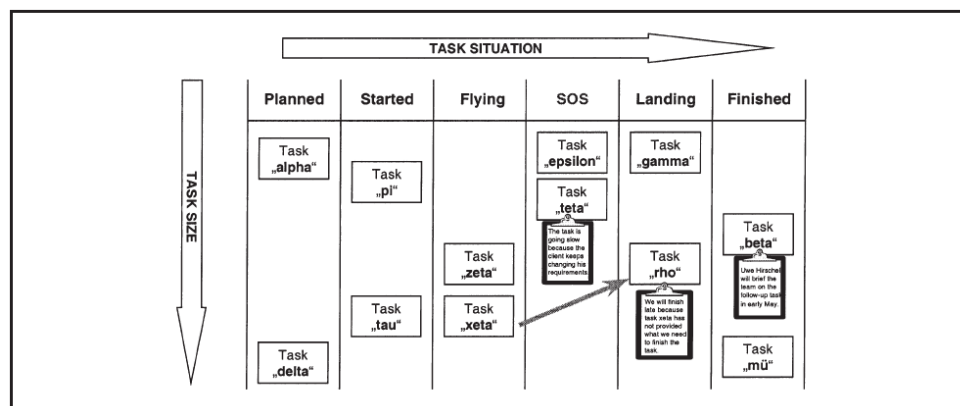
Source: Eppler and Sukowski, 2000, p.339.

Often in a central location, the Flight Plan identified individual tasks and any tasks issues (Eppler & Sukowski, 2000). Another specific team communication tool cited in the literature is the Team Discussion Board (Chiocchio, 2007). The Team Discussion Board is a method to share ideas and documents and provides feedback to allow team members to collectively receive and share communication (Badir, Founou, Stricker, & Bourquin, 2003; Chiocchio, 2007). Chiocchio's (2007) research found high performing teams were more active in their use of Team Discussion Board exchanges. Badir et al. (2003) concluded that the Team Discussion Board is an efficient solution to implement, suitable for both co-located teams, sharing a common geographic location, and distributed teams who can be spread across multiple geographic locations.

Further research on communication tools found the more tools used by projects managers (including high technical, low technical and face to face), the more successful the project team is (Ziek & Anderson, 2015). However, earlier work by Otter and Emmitt (2007) cautioned how tools are introduced to teams. They researched the introduction of tools to IT teams, revealing evidence of an understanding gap regarding the appropriate use of tools, and poor management

competencies to stimulate proper tool use. They noted that the rivalry of tools tended to hinder the effectiveness of team communication rather than improve it. Otter and Emmitt (2007) also noted from their research that synchronous communication is more effective than asynchronous use of electronic tools. Eppler et al. (2009) suggested a challenge lies in choosing the most appropriate mode of visualization, from software-based visualization or physical media.

A similar visualisation tool to the Flight Plan is the use of a Strategy Chart for long-range planning to capture activities and events, identifying emergent strategy (Eppler & Platts, 2009).

Figure 8. Auto Components Strategy Chart

Source: Eppler and Platts, 2009, p.51.

On the example strategy chart, (Figure 8 p.36), each coloured note represents separate decision areas, for example, processes and supplies, creating a visual record to enhance understanding of the planned strategy (Eppler & Platts, 2009).

Eppler and Platts (2009) cautioned of issues which may arise with the visualisation communication tools. They suggested participants may see risk due to the transparency of their contributions, possibly leading to participants being less forthcoming, distorting their contributions, or over-constructing their contributions (Eppler & Platts, 2009). They suggested a solution to these challenges may be addressed through project facilitation combining accurate narrative and visualisation messaging (Eppler & Platts, 2009). Moe at al (2010) found trust and shared mental models were fundamental components of success, however, suggested further research should focus on identifying problems which may arise with the introduction of Agile. Moet et al (2010) also suggested shorter spring periods (2-3 weeks) for project teams should be studied as the more frequent communication feedback may affect team learning.

The reviewed literature has concurred that regular communication patterns have a positive effect on shared project goals and project success. A key premise of this study is that while communication is known to be a critical success factor, the parameters of the frequency, the mode and communication tools remain elusive in the literature.

In this study, the Scrum methodology establishes a structured communication frequency and detail (quality) that should be adhered to (Moe et al., 2010; Serrador & Pinto, 2015). That is, communication is time-boxed across four types of defined meetings, (1) the sprint planning meeting (2) the daily stand-up, (3) the product review meeting, and (4) the team retrospective meeting (Schwaber, 2017; Sutherland & Sutherland, 2014). For the purpose of this study communication in Agile/Scrum project management is defined as the constant, effective communication among members of a Scrum team through the four time-boxed meetings and use of communication tools (Sutherland & Sutherland, 2014). The meeting frequency is prescribed through the structure, with the face to face daily stand-up meeting occurring daily, usually at the same time each day throughout the sprint, while the sprint planning meeting occurring prior to each sprint and the review and

retrospective meetings occurring at the end of each sprint (Sutherland & Sutherland, 2014). The narrative communication mode of the meetings is complimented by the visualisation mode of the Scrum board, with a frequency of visualization occurring at least daily, often multiple times a day by varying project participants (Sutherland & Sutherland, 2014).

The communication tools identified in the literature review of non-Agile project management, have similarities with current Agile Scrum practices. The Team Discussion Board and the Flight Plan are visual communication tools which facilitate team communication on project tasks undertaken, and the status of tasks. Similar to the Team Discussion Board and Flight Plan, the "Scrum board" is a visual tool used in Scrum project management identifying all sprint backlog tasks. The Scrum board identifies the status of each task and who in the project team is undertaking the task. The Scrum board is collocated with the project team and updated daily, often multiple times per day, facilitating continuous visual feedback of the project status (Sutherland & Sutherland, 2014).

In combination with the daily stand-up meeting, these tools enable the Scrum team to have early visibility of potential obstacles, further facilitating team communication (Cockburn & Highsmith, 2001; Kim, 2007). Abrahamsson and Pikkarainen (2008) indicate that Agile practices can improve both informal and formal communication. The communication tools, meetings and visual boards incorporated into the Scrum methodology can build group motivation and accountability among individual team members, reducing the phenomenon of social loafing (Balijepally, 2005; Cho, Kim, & Olsen, 2006). Social loafing is a recognised phenomenon of a reduction in an individual team member's contribution to group work (Fang & Chang, 2014).

For the purpose of this study, frequency relates to the regularity of communication within the study framework process; mode refers to the mode of communication, being narrative (verbal) or visualization (visual); tools refer to the Scrum framework communication tools of the Scrum meetings and the Scrum board.

The frequency, clarity and transparency of communication have been associated with high levels of social cohesion and increased accountability among Agile project team members (McAvoy & Butler, 2006; Whitworth & Biddle, 2007).

2.6   The role of accountability in project success.

Consideration of accountability in the literature for the purpose of this study is meant to contextualise communication as related to practitioner behaviour and perceptions.

A recognised source of productivity loss in project teams is the phenomenon of reduced individual accountability and motivation, or Social Loafing, typified by an individual team member's contribution declining within group work (Comer, 1995; Fang & Chang, 2014; Karau & Williams, 1995).

Factors leading to social loafing and subsequent project team productivity losses have been well established, including but not limited to factors identified in the Collective Effort Model, (Figure 9, (Karau & Williams, 1993). Research suggests that individuals are unwilling to exert effort unless they believe their effort is important to the group's performance; their contributions to the group are identifiable; and they like the group they are working with (Harkins & Jackson, 1985; Karau & Williams, 1993).

Figure 9: Collective Effort Model

Source: http://bowling-bash.blogspot.com/2012/04/using-social-psychology-to-motivate.html
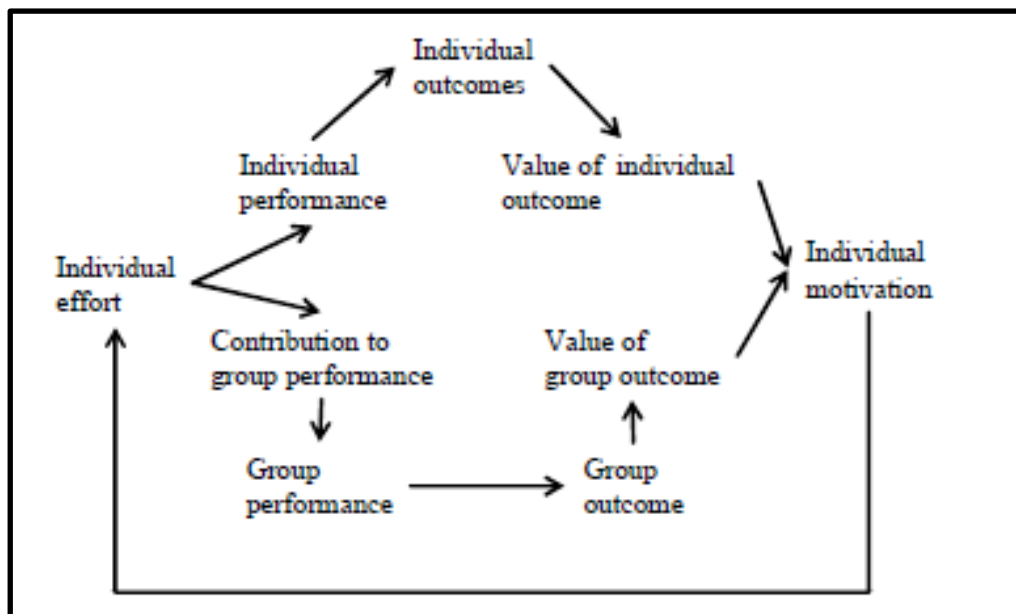
Antecedents of social loafing are: an individual's expectations their effort will be less valued when working collectively (Karau & Williams, 1995); participants not considering their contributions to be unique (Beenen et al., 2004); and the Sucker

Effect when a team member expects their counterparts to slack, so to avoid being taken advantage of, intentionally expends less effort themselves (Orbell & Dawes, 1993). Additionally, larger group size is related to a loss of group coordination (Kravitz & Martin, 1986; Ringelmann, 1913). Specifically, project teams with less than nine team members demonstrated improved productivity compared to project teams with an average of nine or more team members (Rodriguez, Soria, & Campo, 2012).

Smaller group size is associated with reduced social loafing, whereby the visibility of individual contributions and potential for encouragement is increased (Rodríguez, Sicilia, García, & Harrison, 2012). Conversely, in a large group, the individual becomes harder to monitor, be encouraged and can have greater anonymity (Hechter, 1988; Latané, Williams, & Harkins, 1979). Williams et al. (1981) demonstrated that when an individual's productivity is visible, they exert a consistently high level of effort and conversely, a low level of effort is exerted when an individual's productivity is not identifiable. Williams et al. (1981) study suggested an important mediator of social loafing is identifiability.

Hence, some options to reduce social loafing, include tasks being individualised or made as unique as possible for each team member (Harkins & Petty, 1982; Jackson & Williams, 1985); making individual task effort visible to the team (George, 1995; Jones, 1984); and creating individual accountability (Weldon & Gargano, 1988). Furthermore, a team size of fewer than nine members can contribute to individual task visibility, improving individual and team performance (Williams et al., 1981).

Whitworth and Biddle (2007) explored the phenomenon of social loafing in Agile teams and suggested the constant feedback environment allows team members a shared awareness, a team commitment to goals and associated team cohesiveness. They further reported the daily and weekly team meetings became an important motivator for individuals not to show up unprepared to contribute (Whitworth & Biddle, 2007). They concluded aspects of Agile amplified motivation, action and accountability, in particular, the importance of tools which collect and display information and linkages between individual and collective efforts (Whitworth & Biddle, 2007).

McHugh et al. (2012) investigated the effect of the sprint/ iteration planning, daily stand-up, and sprint/iteration retrospective in relation to their effect on trust among Agile team members. They reported Agile increased transparency, communication, knowledge sharing, feedback and accountability, which in turn increased levels of trust among Agile team members (McHugh et al., 2012). Of interest, Agile participants indicated that prior to undertaking Agile methodology, communication did not occur unless required, reporting the communication cadence of Agile was a benefit in creating participant trust (McHugh et al., 2012). As noted above, the conditions to avoid social loafing and increase individual accountability are present in the Scrum framework, including but not limited to communication cadence, sprint planning, the daily stand-up and sprint retrospective. Scrum projects are broken into goals and also listed in the product backlog (Sutherland & Sutherland, 2014). These goals are further broken down into small tasks as the sprint backlog (Sutherland & Sutherland, 2014). The sprint backlog tasks are posted on the Scrum board, which individual members choose based on their experience and knowledge (Sutherland & Sutherland, 2014). Task visibility occurs throughout the project via the Scrum board which displays the tasks in the sprint backlog and the self-assignment of tasks by team members (Sutherland & Sutherland, 2014). This transparency establishes individual identifiability and accountability (Sutherland & Sutherland, 2014).

The daily stand-up meetings are a second method whereby individuals' task visibility is transparent. Each team member updates the project team daily in these meetings, outlining completed tasks, tasks currently being undertaken by that individual, and future tasks (Sutherland & Sutherland, 2014). The regular visible updates via the daily stand-up and scrum board create task visibility and individual accountability. Finally, Scrum teams do not usually exceed nine members limiting the individual's opportunity for anonymity.

2.7   Summary and Gaps

A review of the literature highlights the body of enquiry relating to project success factors, considered critical to project success, remain in debate, perhaps due to the expansion of projects from engineering into multiple business disciplines. Concurrently the application of various project management modalities to multiple

stakeholders since the 1980s has led to a reframing of the project critical success factors (Albert et al., 2017; Kozlowski, 2015; Kozlowski & Ilgen, 2006). Despite the changes taking place in project management, the reviewed literature indicated communication is a widely accepted critical success factor (Ammeter & Dukerich, 2002; Anantatmula, 2010; Belassi & Tukel, 1996; Bolman & Deal, 1992; Davis, 2014; Fortune et al., 2011; Frank Cervone, 2014; Henderson et al., 2016; Pinto & Slevin, 1987; Pinto & Pinto, 1990; Sarin & O'Connor, 2009; Wang & Huang, 2006).

Although many researchers concur on the importance of communication, specific information relating to communication frequency, communication mode and communication tools remain elusive. The literature identifies general themes such as regular meetings focusing on decisions or action items, to establish a consistent mechanism for updating project management parties (Frank Cervone, 2014; Henderson et al., 2016; Turner et al., 2004). The specifics of frequency, length and participant attendance, however, remain elusive.

Overall, Agile project management has been predominantly researched in the software development context. Studies have demonstrated Agile project management facilitates better communication and collaboration within the team, increased customer interaction and increased productivity and speed (Cockburn & Highsmith, 2001; Gustavsson, 2016). Additional benefits of Agile project management include integration of voice of the customer, faster more adaptive response to customer needs, improved development time, improved team communication and faster product to market (Denning, 2015; Serrador & Pinto, 2015; Sommer et al., 2015). Agile methodologies provide a framework which is adaptable to multiple disciplines (Bonassa & Carvalho, 2016). Moe at al (2010) suggested further research should focus on identifying problems which may arise with the introduction of Agile and also suggested shorter spring periods (2-3 weeks) for project teams should be studied as the more frequent communication feedback may affect team learning.

Reviewed literature suggests, however, there is limited empirical data relating to the use of agile project management outside of the software development context. More specifically there are limited examples of the Scrum being studied as a project management framework outside the software development arena. Therefore, more research is required to empirically measure the implementation, effectiveness and outcomes of Agile Scrum implementation outside the IT software development

contexts (Bonassa & Carvalho, 2016; Dingsøyr et al., 2012; Dybå & Dingsøyr, 2008; Serrador & Pinto, 2015; Sommer et al., 2015).

The aim of this study is to extend on previous research by investigating the effectiveness of Scrum as a project management framework, outside software development. Specifically, the current study investigates Scrum within a medical technology sales organisation, using small cross-functional teams to investigate project team members' perceived effectiveness of Scrum. The study also aims to conduct exploratory empirical evidence related to the frequency, mode and tools associated with communication as a critical success factor for successful projects, whilst aiming to identify potential problems encountered in introducing Scrum into project management. The study focus is illustrated in Figure 10 below.

Figure 10. Participant Perceptions
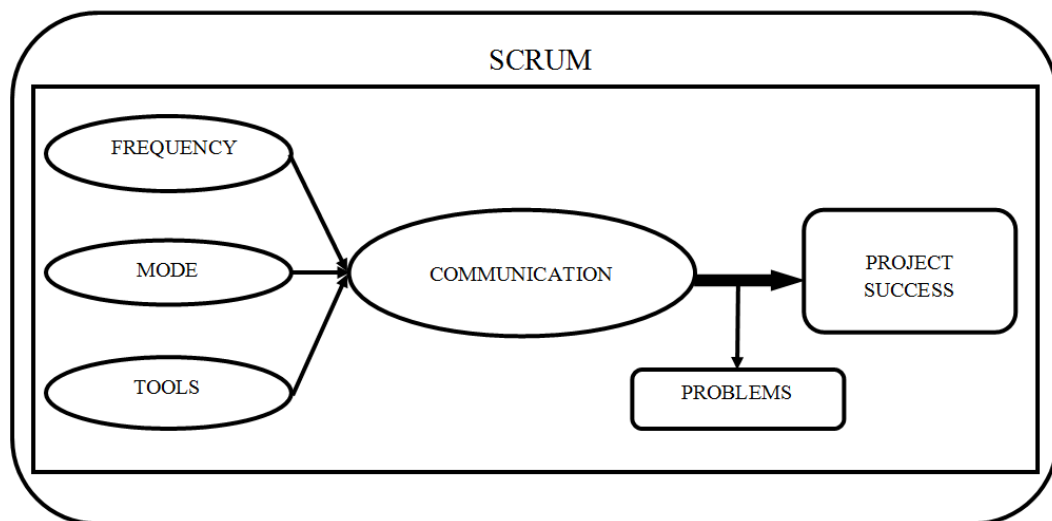
Source: Developed for this research, 2018.

3 CHAPTER THREE: Practice-based Projects

3.1 Background

As outlined in the introduction, the purpose of this study is to introduce an Agile project management framework called Scrum, from the IT software development context into the non-IT industry context of a medical technology organisation. A further purpose of the study is to answer the research question by conducting exploratory research investigating the perception of participants in the Scrum project management framework and explore the empirical parameters of the frequency, mode and tools associated with effective communication in the Scrum project management framework. In order to conduct the research, a work-based project is required to create the context within which the research can take place. Therefore, the work-based learning project of this study is in the form of a case study across five projects of the Scrum methodology in the medical technology organisation.

3.2 Objectives

This aim of this study is to extend on previous research by investigating the effectiveness of Scrum as a project management framework, outside software development. Specifically, the current study investigates Scrum within a medical technology sales organisation, using small cross-functional teams to investigate project team members' perceived effectiveness of Scrum. The study also aims to conduct exploratory empirical evidence related to the frequency, mode and tools associated with communication as a critical success factor for successful projects, while noting any problems which arise from the introduction of Scrum.

The objectives are listed as:
(1) establish the project teams.
(2) develop the project implementation plan.
(3) implement the project according to the Scrum process guidelines (refer to page 14 in the literature review).
(4) collect and analyse sprint retrospective meeting feedback from Scrum participants for perceived commonalities and differences.
(5) design a survey tool reflective of perceived commonalities and differences.
(6) submit and gain ethics approval to conduct the survey.
(7) conduct survey with Scrum participants.

(8) analyse qualitative and quantitative survey data.

(9) report results.

3.3   Project Scope and Timelines

3.3.1   Project Scope

The study is exploratory within a clearly defined context. The nature of the questions requires a qualitative approach, and the context lends itself to a case study. The parameters of the study are outlined as the factors which are in scope and those which are out of scope. In scope refers to those factors which will be included in the research, whilst out of scope refers to those factors which are excluded from the research.

In scope, included in the study, were employees from the medical technology company, the researcher also works for, who were members of a Scrum project team. The seventeen employees included in the study were from the five business or functional silos whose scores were low for the company engagement statement "It's easy to work with other groups to get the job done here" and "Getting work done is easy around here." All employee project team members except the Scrum Master (SM) were co-located in the organisations Sydney head office. In scope was the Scrum project management methodology; projects requiring a small number of team members, less than ten and; projects requiring individuals from two or more different functions.

Out of scope, excluded from the study, were individuals from business silos or functional silos with high scores for the engagement statements noted above; individuals outside of the company Sydney head office, except the SM; employees who had not been members of one of the five Scrum project teams in the study; alternate Agile project management methodologies; projects requiring teams of ten or more members and; projects which would require team members with the same functional skill, rather than cross-functional.

3.3.2   Approach and Timelines

The time between starting the first Scrum project and completing the last Scrum project was thirteen months, between February 2016 to March 2017. Each project team included the three Scrum roles. A Project Owner (PO) who was the lead

driver and vision owner of the project; The Development Team (DT) members who undertook the production of the project tasks and; The Scrum Master (SM) who facilitated the Scrum project process.

The researcher, as a certified Scrum Master, facilitated each project as the Scrum Master. The five Scrum teams consisted of participants from different company business silos, job descriptions and or functional areas. An example of a business silo might be the cardiac sales division, which might include job descriptions in sales, management and marketing. An example of a functional area might be finance, human resources and communication. The combination of project team members from different silos, job descriptions and functions created cross functional cross-function project teams. The team makeup for the five Scrums is illustrated in Table 6. One-week sprints were maintained as a standard review timeframe for both product review meeting and the project team retrospective process meeting. This short review time frame allowed for potential barriers and subsequent process improvements to be identified and implemented early.

The five Scrum projects took, two weeks, one week, two weeks, two weeks and three weeks respectively, a total of ten weeks sprint time. The online survey instrument was administered in October 2017, seven months after the final Scrum project was completed. The quantitative and qualitative survey instrument was open for six weeks to complete.

Table 6: Scrum Project Team Participation

Project Participant Role Description	SCRUM # 1	SCRUM # 2	SCRUM # 3	SCRUM # 4	SCRUM # 5
National Sales Manager	1	1	0	0	0
Regional Sales Manager	0	0	1	0	0
Product sales Person	1	1	1	0	0
Technical Customer Service	1	1	0	0	0
Product Marketing	1	1	1	0	0
Finance	1	1	0	0	0
Director Human Resources	0	0	0	0	1
Human Resources	0	0	1	3	1
Talent Development	0	0	0	1	1
Communications Manager	0	0	1	0	1
Communications	0	0	0	0	1
Total # Team Members	**5**	**5**	**5**	**4**	**5**
# Silos	**2**	**3**	**5**	**1**	**2**
# Functions	**5**	**5**	**5**	**2**	**5**

Source: Developed for this research, 2018.

A more detailed description of the Scrum processes undertaken in this research is outlined below. The descriptions follow the same twelve steps outlined in section 2.1 "Agile Project Management."

1. Defining a current state and future state.

Each project in the study was the result of a perceived problem or recognised opportunity from a functional leader or manager. In each case, the functional leader or manager took the role of PO in the Scrum project framework. In each instance, the researcher was invited to use the Scrum framework to facilitate a project team to solve the perceived problem or opportunity. The researcher as a certified Scrum master worked with the PO to ensure the PO could define and articulate their current state and future state.

2. Creating a future state vision statement to guide the project.

Once the future state was defined the PO then defined the Vision statement under the guidance of the SM using a generic Vision Statement template (Appendix 8.1). The vision statement meeting was carried out face to face and was timeboxed for an hour to complete.

3. Identifying the skill set of the Development Team most likely to achieve future state, hence build a team around the vision.

Once the vision statement was completed, the PO and SM discussed the required skills to complete the project successfully. Different yet complementary skills were sought. Some individuals were identified due to broader experience across functions and organisations; others were chosen due to a specific skill set. Each potential project team member was approached by the PO and SM. The PO outlined the project goal, and the SM outlined the Scrum project management methodology. Interestingly some potential team members at first baulked at joining a project team for two common reasons. First, they had been on other project teams in the organisation and were "jaded" by endless long meetings with seemingly poorly defined outcomes. Second, they had not been on a project team before and felt they did not have much to offer the team. In all cases, barring one, those individuals approached joined the project team. The opportunity to be involved in a new project methodology, Scrum, was the main attraction they verbalised. The one person who

declined, after being initially asked, became ill and due to some days off work, declined to be on a team, feeling he was not able to adequately offer time or energy to the project. Each potential team member's supervisor agreed to allow their direct report to dedicate time from their normal duties to be available for Scrum team meetings and project work.

4. Agreeing on "Definition of Done" creates transparency when the work is finished.

The PO is asked to develop a Definition of Done for each project before the planning meeting. The project planning meeting takes between two and three hours. The first project planning meeting for this study, consisted of (i) An outline of Scrum framework and expected process, (ii) Presentation of the current state, future state and vision by the PO, (iii) Invitation to review and "tweak" the vision to create team ownership of that vision, (iv) Build user stories (Product Backlog) relating to the vision, (v) Arrange Product Backlog by the team (including the PO), highest value to lowest value for Customer/Stakeholder. Final hierarchy (the Scrum Backlog) review by PO, being the voice of the customer, (vi) Build task list for the highest value Product backlog item, (the Sprint Backlog) and (vii) agree on a time for Daily Stand up meetings. Further details below.

5. Listing all actions reasonable to reach the future state, this creates the Product Backlog".

All team members were involved in listing actions. The process included having large pieces of paper attached to the wall with Definition of Done (future goal) written on the top, and each team member writing on post it notes the proposed actions required to meet the future goal.

6. Identifying the highest value action and rearranging the list with the highest value at the top.

Once all potential actions were written, the team grouped similar actions into groups and created headings to identify the groups (Product Backlog). The PO and team members then discussed the value of each action group, after which the PO rearranged the groups (Product Backlog) with the highest value group at the top.

7. Building a task list to be able to complete the highest value action, the "Sprint Backlog".

Team members used post-it notes to create a list of tasks which would be required to complete the highest value item. The task list was discussed, and tasks were challenged by the Scrum master to see if (1) they were in scope, would that task be necessary to achieve the goal or nice to have? (2) could the tasks be further broken into small tasks (3) was there an alternate task which would provide a quicker result? Once the task list was finalised, the teams were ready for their first Sprint to complete all of the tasks. They then estimated how many tasks they could achieve in the first one-week sprint; this became the first Sprint Backlog.

8. "SPRINT": one to four weekly cycles to complete the Sprint Backlog task list.

For all of the projects in this study, the teams agreed to one-week sprints to allow a short time frame for feedback to review of process and output. As suggested by Moe et al (2010) short sprints will allow for more frequent team feedback which may affect team learning.

9. "Scrum Board"

A central location for the Scrum Board was decided, and all sprint backlog tasks were added to the board. Each team member was requested to write their name on a task when they picked it, to create further transparency, the task once picked was added to the "Doing" column. A modification was made to the Scrum Board from its typical three columns of Sprint Backlog, Doing and Done. A fourth column, the Barrier column, was added to the left of Done. The barrier column was in response to a pilot project the researcher facilitated as a Scrum master. The barrier column was used when a member of the DT could no longer advance a task. The DT members added the task ticket to the barrier column which was a visual invitation to another team member to assist with the task. In this way it was clear each task in the "doing" column was being worked on and was not "assisted" by others, ensuring two people were not working on the same task until the task entered the barrier column. Use of the barrier column allowed a non-threatening way for team members to ask for help on a particular task. The scrum board was updated daily, and a photograph of the

Scrum board was sent to the SM at the end of each day by a team member to ensure the SM could review the board before the next morning's daily stand up meeting.

10. "Daily Stand Up Meeting" 10-15 min call for a team on project progress.

The time of the daily stand-up was agreed upon at the initial meeting. Daily stand-up meetings of 10 minutes were booked in advance using WebEx calendar booking, typically between at 7:50 am to 8:50 am daily, as decided by the project team. The WebEx option allowed team members to call via the WebEx app if they were not able to meet together in the head office at meeting time. Teams were encouraged to stand around the Scrum board to create a visible platform to strengthen their responses. As previously discussed, many team members were used to long ill-focussed meetings from prior project methodologies, so the idea of a daily call was met with an initial negative response by most team members. However, the Scrum meetings were time-boxed, structured and focussed. The SM facilitated the daily stand-up meetings. Each meeting started with the SM reminding the team of the future state vision, to have a daily reminder of the project goal. The SM then asked each team member to answer the three questions uninterrupted. (1) What did you do yesterday to advance the project? (2) What will you do today to advance the project? (3) What barrier is in your way to advancing the project?

Any barriers were agreed to be taken offline and discussed between the SM the PO and the DT member who identified the barrier. No problem solving or interruptions were allowed so that team members could answer the three focus questions without interruptions. All daily stand-up meetings started on time, irrespective of how many of the team members were present. Team members soon understood the start times of the meetings were strictly adhered to and that meeting times were short. On rare occasion, a team member could not make the meeting time, they initiated an email of their responses to the SM answering the three daily stand-up questions before the meeting, ensuring their project update was shared with the broader scrum team by the SM. Starting on time was a novelty for most team members, who were used to meetings starting late due to team members late arrival time. DT members found this was not the case with Scrum, and after a DT member turned up late once, all DT members then turned up prior to subsequent meeting start times. With starting on time, no small talk, no interruptions and barriers were taken

offline, the recorded average meeting time over the five Scrums, entailing fifty meetings, was seven minutes.

11. End of Sprint review meeting of output to check still on track.

The review meeting included the project team with the stakeholders. The review meeting was a face to face meeting, time-boxed for one hour. The product/solution was discussed, commonly around the Scrum Board, to reflect the product back to the original goal. In four of the projects, the final product was agreed as "Done" and reflected what the original goal/vision set out to achieve. In one Project, the end project uncovered a more valuable potential solution. Hence the team was asked to pivot to create a new product. The pivot and subsequent second Scrum project resulted in one team completing two Scrum projects.

12. End of Sprint Retrospective Meeting:

In the retrospective meeting, all team members reviewed the Sprint process and reflected on what went well, what didn't go well and what to do differently to improve the team for the next Sprint. The retrospective meeting was a face to face meeting, time-boxed for 60 minutes, though typically completed in 45 minutes in the five Scrums. Each of these meetings was journaled by the researcher and used for the initial analysis of common reflections by the team members which was then used to build the survey questionnaire for this study. A copy of the retrospective meeting notes for each Scrum can be found in the Appendix 8.1.2.

3.3.3   Conclusion

The work-based learning project was successful in achieving its goals of process and success.

Criteria for Process was following the Scrum methodology and was conducted as below.

- Each of the five Scrum projects consisted of a Project Owner, Scrum Master and Development Team.
- All Scrum projects had a defined a current state and future state.
- All Scrum projects had a future state vision statement to guide the project.
- All Scrum projects identifying skill set most likely to achieve future state so built a team around the vision.

- All Scrum teams had an agreed Definition of Done.

- All Scrum projects started with a Scrum planning meeting including all project team members.

- Product Backlog was created for each Scrum, listing all actions to reach future state.

- The Product Backlog in each Scrum was re-ordered to create a list of highest value item at the top, to lowest value items on the bottom.

- Each Scrum project created a Sprint Backlog from the highest value item in the Scrum backlog.

- Weekly Sprints were time-boxed to complete the Sprint Backlog task list.

- Sprint Backlog chart was used for each Scrum, referred to in each Scrum as the "Scrum Board".

- Daily Stand Up meetings were conducted each day of the project, time-boxed to 10 minutes.

- A Sprint review meeting to check product/solution still on track with stakeholders/customers was conducted for each Scrum project.

- A Sprint retrospective meeting with the entire project team was completed for each Scrum team, time-boxed for 60 minutes.

Criteria for Success was achieving the stated aims of the project implementation plan.

- Five Scrum project teams were created for five different projects.

- Each project team received Scrum introduction and education.

- Each project was implemented according to the Scrum process guidelines (refer to Section 2.1 page 14).

- Each Scrum project was completed achieving the defined "Definition of Done" so producing the expecting product/outcome of the stakeholders.

- Retrospective participant feedback data was collected and analysed commonalities and differences.

- An online survey tool reflective of perceived commonalities and differences was designed.

- Ethics was gained from USQ to administer the survey tool.

- Scrum project participants were invited to complete an online survey tool.

- Qualitative and quantitative survey data results were analysed.

- Results are reported and documented in Chapter five.

According to these criteria, the projects were conducted according to the Scrum process and deemed successful by the product owners and stakeholders, and therefore created an enabling environment for the research methodology.

4 CHAPTER FOUR: Methodology

4.1 Paradigm

In order to answer the research questions, required the recognition that there were a) exploratory and b) multiple perspectives might exist therefore a constructivist paradigm was appropriate. A constructivist paradigm is typically associated with qualitative approach, with researchers seeking to understand the meaning of phenomena, formed through the subjective views of study participants (Creswell, 2003; Creswell & Plano Clark, 2011). In this form of inquiry, research is shaped from individual perspectives, and there can be multiple participant meanings which create broad patterns. Understanding the patterns ultimately leads to generalisations and theory generation (Creswell, 2003; Creswell & Plano Clark, 2011).

Social constructivism has the perspective that individuals learn through their understanding and knowledge of their environment. Reflecting on their experiences individuals adopt subjective meanings of those experiences (Creswell, 2003). With individuals having different experiences leads to multiple potential perspectives depending on the world in which they reside (Creswell, 2003).

In constructivist paradigm, rather than starting with a theory, the researchers interpret the perceptions others have about the world, using qualitative research to generate meaning from the data (Creswell, 2003).

4.2 Strategy of Enquiry

The nature of the questions requires a qualitative approach, and the context lends itself to a case study.

The five Scrum project team participants in this case study were all employees of the medical technology organisation the researcher was employed with. The five Scrum projects make up the case study. Branch et al. (2014) suggested a case can be an organisational situation requiring study or experimentation. Davis and Wilcock (2003, p. 3) define case studies as "student centred activities based on topics that demonstrate theoretical concepts in an applied setting." Adding to this Yadav et al.

(2007) suggested case-based learning occurs through realistic narratives in an authentic context.

A qualitative instrument identified participant perceptions of the Scrum methodology and if they validated or negated the common themes identified in the post-sprint retrospective meetings. Qualitative questions illuminated the reasons behind these participant perceptions. The research question posed benefited from using complementary quantitative (numerical) questions to test the statistically significant relationship to the qualitative questions.

4.3   Design

The study was designed in two phases and six steps (Figure 11 p.57). The participants in the study were all members of projects using the Agile Scrum methodology. The researcher is a certified Scrum Master (SM) and was appointed SM for the five Scrum projects. There was a total of seventeen participants making up the Scrum teams over the five projects (Table 6 p.47). All seventeen of the Scrum participants attended the phase 1 retrospective meeting. Thirteen of the participants completed the phase 2 online survey.

All the seventeen team members participating in the five Scrum projects were included in the online study survey. Participants consisted of the following functional affiliations: Communications n=2 (12%), Human Resources n=6 (36%), HR Talent Development n=1 (6%), Sales n=2 (12%), Sales Management n=2 (12%), Marketing n=2 (12%), Technical Customer Service n=1 (6%) and Finance n=1 (6%).

Phase 1: Initially, a qualitative sprint retrospective meeting was conducted at the end of each sprint with the entire Scrum team. The questions asked in phase 1 remained consistent with each retrospective meeting. (1) What worked well in the team during the sprint? (2) What didn't work well in the sprint? (3) What could be improved for the next sprint? The qualitative meeting participant responses were notated and investigated for common themes which were used to design Phase 2 survey questionnaire. Common themes were identified using thematic coding which involved identifying linked responses. The linked responses were indexed into common categories establishing common themes (see Figure 12 page 68).

Phase 2: The researcher used a qualitative study design with complementary quantitative questions. The identified emerging themes from the Phase 1 responses were used to design the qualitative semi-structured questionnaire to investigate the legitimacy of the identified themes from Phase 1. A secondary complementary set of quantitative (numerical) questions were designed, using a five-point Likert scale, to support the qualitative responses. Quantitative questions were used to test the statistically significant relationship to the qualitative questions.

Figure 11. Study Design
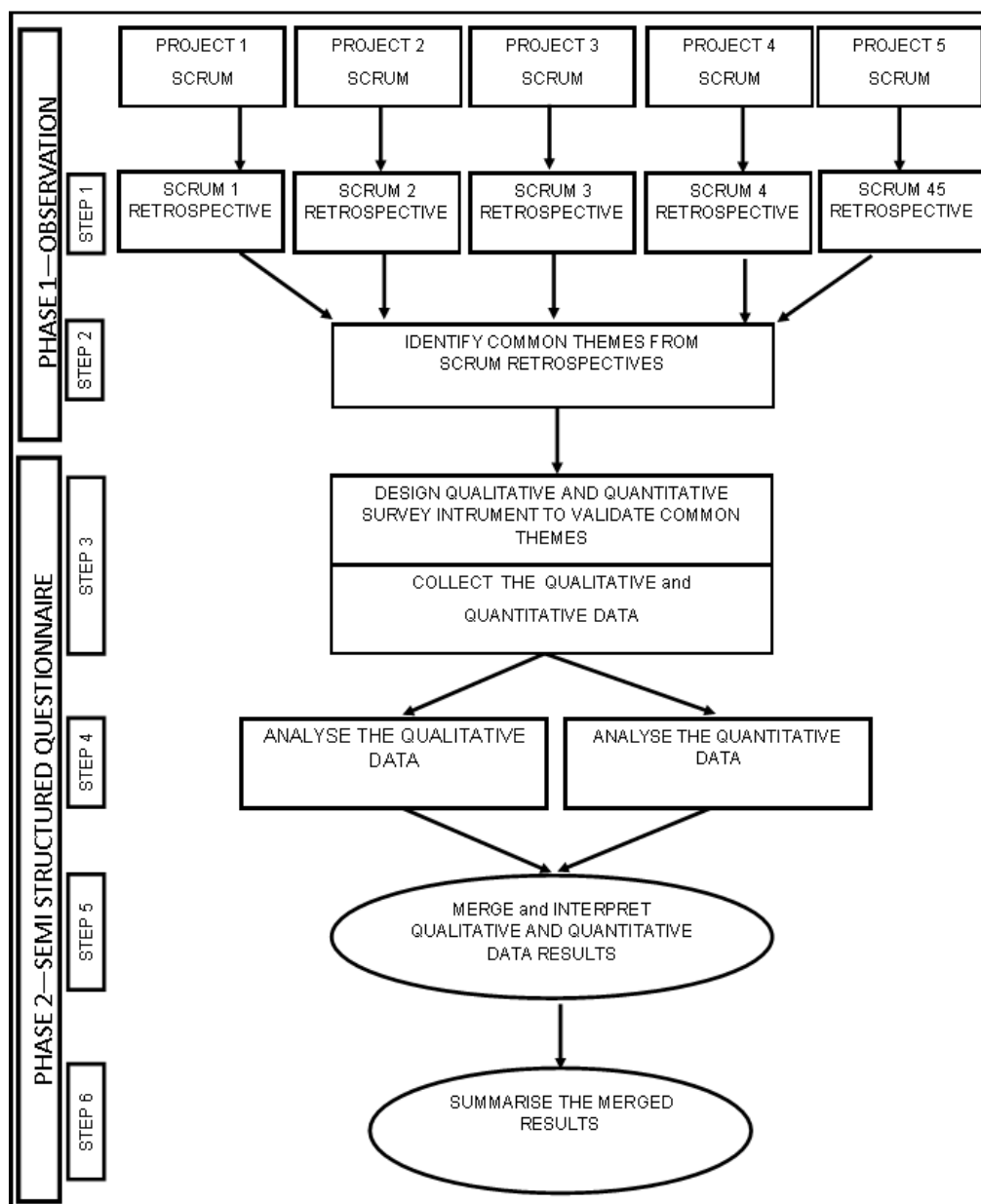
Source: Adapted from Creswell and Plano Clarke, 2011, p.79

Step 1: A functional step of the Scrum project is to carry out a sprint retrospective meeting involving the entire Scrum team after the project sprint is completed. The retrospective meeting aims to gather feedback from each team member in the project team; it is essentially a "self-inspection." The retrospective meeting provides the opportunity for the project team to discuss and understand what went well in the project, what didn't go well and what could be improved to make the next project sprint more effective. These themes are explored with the entire Scrum team by asking each participant to reflect on their experience in the team during the most recent sprint. The following questions were used in this phase; (1) What worked well in the team during the sprint? (2) What didn't work well in the sprint? (3) What could be improved for the next sprint?

Step 2: From the feedback notes of each of the five Scrum project retrospectives, the researcher used word association and word commonality to identify common themes.

Step 3: The most common words and themes identified, provided the design of the study instrument, a qualitative and quantitative survey tool. Upon ethics approval, all seventeen participants in the five Scrum project teams were invited to participate in the survey.

The survey instrument provided to the participants was a set of online survey questions. The participants were required to have participated in one or more of the five Scrum projects carried out for this study, either as a Product Owner or Development Team member. The survey instrument consisted of qualitative questions to identify individuals' perceptions of the Scrum methodology and identify if responses confirmed or negated the common themes identified in the post-Scrum Retrospective meetings. A complimentary set of quantitative research questions was used to determine whether a statistically significant relationship existed with the qualitative questions.

Upon consent, at the initiation of the survey, all seventeen Scrum project team participants were invited to participate in the survey. Fourteen project team members consented to participate in the online survey. Of those fouteen who consented, thirteen participants completed the online survey questionnaire. The

completed surveys were received from members representing all five Scrum project teams. Respondents included a cross-section of hierarchical positions and functional backgrounds within the broader organisation, including Human Resources, Marketing, Sales Management, Clinical Sales, Technical Clinical Support and Communications. The qualitative data using open-ended survey questions and quantitative data utilising a five-point Likert scale was collected through the online survey tool, Survey Monkey. From the thirteen participants who completed the survey, all five Scrum project teams were represented.

Step 4: Qualitative data was analysed using content and thematic analysis with frequency analysis to identify commonalities and differences and for theme development. The quantitative survey results were analysed using the IBM SPSS Statistics software. The quantitative survey questions had a significance threshold set at $p < 0.05$. In addition, correlation analysis, despite the small sample size was deemed appropriate.

Step 5: The qualitative results were merged with the quantitative results and interpreted. The quantitative statistical results are summarised in Table 12 (p. 90) in the results section (a further copy in Appendix 8.5 p.145).

4.4 Ethical Considerations

The following ethical considerations were considered before conducting the study. The researcher gained ethics approval through USQ, approval number H17REA189 (see in Appendix 8.6 p.147). The researcher also gained approval from the med tech organisation (Techo) Director of Legal Affairs and Director of Human Resources where the five Scrum projects were undertaken.

The following factors were considered regarding potential ethical issues with participants

- Study information forms which stated the goal of the study, the researcher and the tertiary institution (University of Southern Queensland) the researcher is associated with.
- Consent (which state the overall purpose and any risks or benefits of participating).

- Potential risks that could be involved in any questioning (emotional distress, dignity).

- Confidentiality of participants (anonymity) and company.

- No identifiable attributes of study participants in questionnaire.

- Provide feedback on results to participants in an appropriate timeframe.

- Indebted reciprocity is reasonable.

- Results storage in a secure offline storage device with a password known only to the researcher.

5   CHAPTER FIVE: Results and Discussion

5.1   Introduction

The study's aim was to consider the perceptions of project team members as to their experiences using the Scrum framework on projects that were deemed a success. The study selected five projects in a company that constituted a case study. The case study included capturing the retrospective perceptions of the Scrum project team members to identify common themes relating to the Scrum process. This was followed by the administration of a questionnaire to investigate the legitimacy of the identified themes.

This chapter describes the research results followed by a discussion on the findings of the research. The results sections highlight identified areas of notable agreement among study participants and also identified areas of notable disagreement from study participants. As outlined in Chapter 4 , the study design comprises two phases. Phase 1 was an observational phase, followed by Phase 2 consisting of the application of a questionnaire. This chapter follows the same sequence as the phases. In the observation Phase 1, qualitative results are represented, reported upon and then discussed. The Phase 2 qualitative questionnaire results are then presented and reported and then discussed as emerging themes followed by phase 2 quantitative questionnaire results, which are presented, and the frequencies and correlations are reported. The quantitative results are then discussed in relation to the frequencies and correlations. The chapter describes study limitations, followed by conclusions,

5.2   Phase 1: Observation

Phase 1 observed the retrospective meetings held at the end of each sprint, to assess the Scrum teams perceptions of the Scrum processes for the completed sprint. The questions asked in each retrospective meeting were consistent across all five Scrum teams; (1) What worked well in the team during the sprint? (2) What didn't work well in the sprint? (3) What could be improved for the next sprint? The participant's responses are presented in four tables. Table 7. Product Owner Responses, Table 8. Development Team Responses, Table 9. Improvement Opportunity Responses and Table 10. Emerging Themes.

5.2.1   Phase 1: Results

The following tables consist of the collated responses of the Scrum project participants during the sprint retrospective meetings for each Scrum. The table columns are headed Scrums #1 through to Scrum #5. The responses recorded for each Scrum appear in their respective columns for each Scrum. The results when observed and recorded in a journal were labelled as responses from either the Scrum Product Owner (PO) or the Scrum Development Team (DT) members.

Table 7 shows the collated responses of the Product Owners (PO) from the Scrum retrospective meetings. In the column labelled Scrum #1 through to Scrum #5 are the responses of the POs for those respective Scrums.

Table 7: Product Owner Sprint Retrospective Meeting Responses

	Scrum #1	Scrum #2	Scrum #3	Scrum #4	Scrum #5
PO Responses	Fast way to achieve high-value outcomes. The process created clear accountability. Daily stand-up was excellent for continuous communication. Output was great, actually had an output! A lot of market insights gained from results. Uncovered pivot to a new direction not thought of previously. Short time frame from start to finish of project was refreshing. Has set aside budget for Scrum training of team members. Agreed Scrum board in office for future projects would be positive	Narrower vision created clarity for team. Scrum process creates targeted focused results. Scrum process creates momentum. Sending Scrum board pictures out to team each day was good update for team.	Scrum improved actions of group. Scrum fast tracked team activities. Like to do Scrum again for next project. But would like more time with Scrum theory next time… just jumped in. Am sure I can do more as a PO.	Team knowing each other well worked with overall communication. Co-located team worked well. Standing around Scrum board for daily stand-ups worked well.	Stand-up meeting worked well, communication set tone for day, everyone knew what to do next. The team was so efficient. I have never been this ready so far out for an event, usually last-minute rush!

In the PO perspective, it seemed there was agreement around increased project clarity/transparency. Responses indicating clarity included "created clarity," "creates targeted focused results," and "created transparency." There was also a common agreement with reference to momentum as indicated in responses, "short time frame," "process creates momentum," and "fast tracked team activities." The PO responses made a note of the daily stand-up in conjunction with transparency/clarity and communication.

Table 8 shows the collated responses of the Development Team (DT) members from the Scrum retrospective meetings. In the column labelled Scrum #1

through to column labelled Scrum #5 are the responses of the DT members for the respective five Scrum retrospective meetings.

Table 8: Development Team Sprint Retrospective Meeting Responses

	Scrum #1	Scrum #2	Scrum #3	Scrum #4	Scrum #5
DT Responses	Vision a bit ambiguous / needs to be clearer / need to refer to vision regularly. Liked the process, unsure if the output was valuable due to ambiguous vision. No wasted effort knew what to do at all times. Vision didn't inspire clear goal. The continued pace was refreshing. Daily meetings good to keep the momentum. Review to stakeholders needs to involve Product Owner (PO was overseas at the time of retrospective), as PO vision lost in the presentation by the team. No wasting time during project, efficent process. Scrum board more central location would be better. Good continuous communication throughout project. Team member questioned their own contribution value, but positive about the Scrum process. Was quick, targeted and focused use of team time. No doubling up of workflows. Clear who was doing what. Want to use process in own Business Unit.	Liked Scrum process, no time wasting. Liked knowing what everyone was doing, daily stand-up excellent for visibility. Scrum processes are excellent, clear what I was doing. Also liked the clarity of whos doing what from Scrum board and daily stand-up. Clarity of project workflow of what and when and where the project is up to. Process efficient for time as all have "daytime jobs." Clearer vision kept team focussed on tasks, what we were doing. Better Scrum board use, more accessible. Daily stand-up excellent, "keeps me up to date". Personally time poor, but projects clear actions/tasks to be done meant no time wasting. Daily stand-up meetings excellent for project updates. Daily meeting and scrum board updates meant always knew where the project was at. Clear who is doing what at all times.	Like to understand more theory on the process, perhaps more time before jump in to go over the process. Scrum process focussed the group to action. Loved the open communication and transparency. Stand-ups great (after initial negative thoughts of a daily meeting). Kept information flowing. Maybe use an electronic tool for Scrum board to capture actions? Liked the Scrum concept, it was easy to kick off and go! Scrum was quick to get to results, was motivating. Clear communication, daily stand-up was excellent despite not wanting to do daily meetings. Great model for projects. Clear accountability, cannot hide! Rapid results, felt like we achieved really quickly. The actionable tasks and outcomes meant not wasting time. Process meant always up to date where the team and project was at. Increased project and team communication was excellent from daily stand-up and Scrum board. Actions were known for each person, no ambiguity of tasks/roles.	Daily stand-ups were surprisingly short yet created continuous communication so process powerful to keep the team on track. Standing around the Scrum board in the morning highlighted daily stand-up making things clearer. I did not want to be seen to not achieving, process kept accountability real! Agree with accountability, I didn't want to be "the one" at daily stand-up who had not achieved anything. Seeing items move on Scrum board was positive reinforcement of project momentum. The team committed to helping each other out as Scrum board, and daily standup created "team effect." Daily stand-up calls worked surprisingly well, did not impose on day/time, kept everyone informed and accountable . Scrum board created visibility during the day to remind me what was to be done. It stopped procrastination. Agree with comments regarding improved communication and increased accountability due to daily stand-up and Scrum board. Scrum board also created a distraction (in a good way) as I wanted to keep doing Scrum actions instead of other work. Momentum was continuous, suddenly we had a lot achieved.	Daily [stand-up meeting] created transparency, knew what was happening. Early morning for stand-up helped plan day, clear priorities. Daily stand-up at start of day created accountability for days actions. No thoughts like "is this going to work?" Felt in control at all times, positive vibe. Enjoyed process, I could see all the moving pieces as they were happening, loved the transparency. Want to use process in other projects, wish I had known this before now! Always in control, no sense of urgency crept in. Stand-up timing at start of day was good for clarity of project progress and what to do next. The process was dynamic, always updating and could see progress. Kept interest in the project due to constant update on Scrum board and the daily stand-up. Would like to see earlier feedback on potential constraints (what's out of scope). Loved process, now scrumming house build and husband. Built accountability to all team members. Stand-up was a great start to the day to know what to tackle next. Hadn't exhausted all potential tasks before starting, should we?

The responses in Table 8 indicate a number of notable observations. From the DT members perspective, it seemed there was agreement around project clarity with a range of terms being used such as "transparency/clear actions/visibility/ clear vision," appearing regularly. Another area of notable agreement in the responses related to accountability, with terms such as "accountability/ increased accountability / clear accountability" used in the responses. A further area of notable agreement from the DT members was that the Scrum process increased project momentum, with examples including "quick results/ rapid results/ targeted/ kept team on track". The fourth area of notable agreement was communication being referenced by the DT members as "communication/ clear communication/ open communication/ improved communication." The communication tools of the Scrum board and daily stand-up meeting were referred throughout the responses, in conjunction with the notable areas of agreement listed above.

There were also two notable detracting responses. First was related to the project vision in Scrum #1. Three responses noted the vision needed to be clearer and one response suggested the vision needed to be referenced more regularly. A second response was to improve Scrum board visibility. These responses will be discussed further in Section 5.2.2.

Table 9 displays the responses from the Scrum team members, which reflect the opportunities to improve the sprint process. These improvement opportunities are from the combined PO and DT members. The responses were collated from each Scrum retrospective meeting.

Table 9. Improvement Opportunity Responses

	Scrum #1	Scrum #2	Scrum #3	Scrum #4	Scrum #5
Improvement opportunities	Vision statement ambiguous/ didn't inspire clear goal/need to reiterate vision statement more regularly. Scrum Board needed in more central location place / more visible. PO needs to be in review process with stakeholders / PO needs to be able to articulate the vision	Clearer vision discussed during Sprint planning meeting worked well, better team buy in to project goal. Restating vision at each stand up kept project goal in focus. More visible Scrum Board with daily email pic updates was helpful.	Spend more time with first meeting allowing the team to understand Scrum process in more depth . Maybe an electronic tool for capturing actions?	Having daily stand-up meeting around the Scrum board reinforced the project visibility. Could add names in different colours to create more visual clarity.	Spend more time in first meeting checking all User Story tasks exhausted. Would like to see earlier feedback on potential constraints (out of scope), discuss "in scope" and "out of scope" more to get consensus.

From the improvement opportunities responses, notable agreement occurred regarding the vision statement ambiguity and the vision statement could be referred to "more regularly" in the Scrum process. There was also agreement in responses that the Scrum board needed to be "more visible." There were further responses agreeing the initial Scrum meeting could spend more time on "Scrum process."

In Scrum #1, a response highlighted the PO was absent for the review meeting with stakeholders, and in future should be present to "articulate the vision." The project scope was also noted as a potential improvement opportunity. Firstly, to spend more time to check user stories were fully examined prior to starting the sprint. The second improvement suggestion related to the scope was to spend more time in the initial meeting to gain consensus around "in scope and out of scope" tasks for the project. These responses will be discussed further in Section 5.2.2.

Table 10 shows a collection of notable agreements of the PO and the DT members, for each of the five Scrum projects. These agreements indicate some emerging themes are appearing from the responses.

Table 10. Emerging Themes

	Scrum #1	Scrum #2	Scrum #3	Scrum #4	Scrum #5
Emerging Themes	Speed, clarity, accountability and continuous communication. Daily stand-up associated with enhancing communication	Clarity, momentum, efficiency, Daily stand-up and Scrum board associated with project clarity.	Speed of project momentum / clarity of open communication / accountability / focussed actionable outcomes.	Accountability / Daily stand-up associated with increased accountability / clarity. Increased communication. Visibility from Scrum board.	Daily stand-up with transparency, communication and accountability. Clarity and accountability ongoing themes.

In Scrum #1, project clarity, accountability, speed and communication were emerging themes, with the daily stand-up associated with enhancing communication. In Scrum #2 emerging themes included project momentum/efficiency as well as highlighting project clarity. The daily stand-up remained an emerging theme, associated with clarity. The Scrum #3 emerging themes included project speed and momentum, clarity of open communication, accountability and introduced focused and actionable outcomes. In Scrum #4 responses similarly highlight increased communication, clarity and accountability. The responses indicated the association of accountability with the daily stand-up. The Scrum board was also associated with

visibility/clarity. In Scrum #5 emerging themes were clarity and accountability. The Daily stand-up was associated with transparency, communication and accountability.

Clarity:

Responses referring to clarity included "clear communication," "liked the clarity of who's doing what from Scrum board and daily stand-up," "clear who is doing what," "liked the open communication transparency," "could see all the moving pieces as they were happening, loved the transparency", "daily stand-up created transparency," and "knew what to do at all times."

The daily stand-up was referenced by the POs in relation to clarity with "daily stand-up created transparency," "daily stand-up was excellent for continuous communication," and "time of day (early morning) for "[daily] stand-up worked well, communication set tone for the day." The DT members also referenced the daily stand-up with the theme of clarity, for example, "daily stand-up keeps me up to date," "like the clarity of who's doing what from the Scrum board and the daily stand-up," "daily meetings and the Scrum board updates meant always knew where the project was at," and "[daily] stand-up was good for clarity of day."

Accountability:

Examples of accountability responses included "the process created clear accountability," "clear who is doing what," "no ambiguity of tasks/roles," "the process created clear accountability," "did not want to be seen to [be] not achieving, process kept accountability real," "stand-up at the beginning of the day created accountability," and "actions were known for each person, no ambiguity of tasks/roles."

The daily stand-up was also referenced to accountability with "[daily] stand-up at the start of the day created accountability," "agree with accountability, didn't want to be the one at daily stand-up who hadn't achieved anything," and "improved communication and increased accountability due to daily stand-up and Scrum board."

Momentum:

Responses referring to momentum from the POs include "Scrum process creates momentum," "Scrum fast-tracked group activities," "short time frame from start to

finish of project was refreshing," and "fast way to achieve high-value outcomes." Momentum responses from the DT members include "daily meetings were good to keep the momentum," "the continuous pace was refreshing," "rapid results, felt like we achieved really quickly," "momentum was continuous, suddenly we had a lot achieved," "the process was dynamic, always updating and could see progress," and "seeing items move on the Scrum board was positive reinforcement of project momentum."

Strengthening the perception of momentum from the Scrum process were responses which related to the speed and efficacy of the Scrum methodology. Example responses from the POs include "the team was so efficient, I've never been this ready so far out from an event." Responses relating to efficacy from the DT members include "no time wasting," "no wasted effort, knew what to do at all times," "process efficient for time," and "actionable outcomes, no time wasting."

The daily stand-up was also referenced by the DT members in relation to momentum with responses such as "Daily [stand-up] meetings good to keep the momentum," and "[Daily] stand-up was a great start to the day to know what to tackle next," and "kept interest in the project due to constant update in Scrum and daily stand-up." The Scrum board was referenced in relation to momentum with the following example, "seeing items move on [the] Scrum board was positive reinforcement of project momentum," "Scrum board created a distraction , in a good way, as I wanted to keep doing Scrum actions instead of other work."

Communication:
Communication was referenced through the results with particular emphasis on the communication tools of the daily stan-up and the Scrum board. Example responses include "Clear communication from daily stand-up was excellent, despite not wanting to do a daily meeting," and "Communication was clear and continuous, daily meetings were great."

The combined responses were then examined for the frequency of the emerging themes to further identify which themes were most prevalent in the responses. Figure 12 (page 67) illustrates the frequency of the emerging themes. These emerging themes are discussed in Section 5.2.2.

Figure 12: Scrum Retrospectives: Emerging Themes - Frequency

COMMUNICATION TOOLS (n=24)

Daily meetings good to keep the momentum.
Scrum board pics out each day was good update for team
Also liked the clarity of whos doing what from Scrum board and daily stand-up.
Daily stand-up excellent, "keeps me up to date"
Daily meetings excellent for project updates.
Daily meeting and Scrum board updates meant always knew where the project was at.
Stand-up meetings great after initial negative thoughts of a daily meeting, kept information flowing.
Clear communicatio, daily stand-up was excellent despite not wanting to do daily meetings.
Increased project and team communication was excellent from daily meeting and scrum board.
Daily stand-ups were surprisingly short yet created continuous communication so process powerful to keep team on track
Standing around Scrum board in morning highlighted daily stand-up making things clearer.
Agree with accountability, didn't want to be "the one" at daily stand-up who had not achieved anything.
Seeing items move on Scrum board was positive reinforcement of project momentum
Team committed to help each other out as Scrum board, and daily standup created "team affect."
Daily stand-up calls worked surprisingly well, did not impose on day/time, kept everyone informed and accountable
Scrum board created visibility during day to remind what was to be done, stopped procrastination.
Agree with above comments re communication and accountable due to standup and Scrum board.
Scrum board also created a distraction (in a good way) as wanted to keep doing Scrum actions instead of other work.
Stand-up meeting worked well, communication set tone for day, everyone knew what to do next.
Daily stand-up meeting created transparency, knew what was happening.
Early morning for stand-up helped plan day, clear priorities.
Stand-up timing was good for clarity of project progress and what to do next.
Kept interest in project due to constant update on Scrum board and the daily stand-up.
Stand-up was great start to the day to know what to tackle next.

PROJECT MOMENTUM AND SPEED

Fast way to achieve high-value outcomes
Short time frame from start to finish of project was refreshing.
The continued pace was refreshing
Daily meetings good to keep the momentum.
No wasting time during project, efficient process.
Was quick, targeted and focused use of team time.
Process efficient for time as all have "day time jobs"
Liked Scrum process, no time wasting
Scrum process creates momentum
Personally time poor, but projects clear actions/items to be done meant no time wasting.
Scrum improved actions of group
Scrum fast tracked activities
Scrum process focussed the group to action.
Stand-up meetings great after initial negative thoughts of a daily meeting, kept information flowing.
Liked the Scrum concept, it was easy to kick off and go!
Scrum was quick to get to results, was motivating.
Rapid results, felt like we achieved really quickly.
The actionable tasks and outcomes meant not wasting time.
Seeing items move on Scrum board was positive reinforcement of project momentum
The team were so efficient, I've never been this ready so far out from an event. Usually last-minute rush.
The process was dynamic, always updating and could see progress.
Kept interest in project due to constant update on Scrum board and the daily stand-up.

Scrum Retrospectives

PO and DT responses

PROJECT CLARITY (n=21)

No wasted effort knew what to do at all times
Liked knowing what everyone is doing, daily stand-up good for visibility
Narrower vision created clarity for team.
Scrum process creates targeted focused results.
Scrum process are excellent, clear what I was doing.
Also liked the clarity of whos doing what from Scrum board and daily stand-up.
Clarity of project workflow of what and when and where the project is up to.
Clearer vision kept team focussed on tasks, what we were doing.
Daily stand-up excellent, "keeps me up to date"
Daily meeting and Scrum board updates meant always knew where the project was at.
Loved the open communication and transparency
Process meant always up to date where the team and project was at.
Actions were known for each person, no ambiguity of tasks/roles.
Standing around Scrum board in morning highlighted daily stand-up making things clearer.
Scrum board created visibility during day to remind what was to be done, stopped procrastination.
Stand-up meeting worked well, communication set tone for day, everyone knew what to do next.
Daily stand-up meeting created transparency, knew what was happening.
Early morning for stand-up helped plan day, clear priorities.
Always in control, no sense of urgency crept in.
Stand-up timing was good for clarity of project progress and what to do next.
The process was dynamic, always updating and could see progress.
Stand-up was great start to the day to know what to tackle next.

PROJECT ACCOUNTABILITY (n=9)

The process created clear accountability.
No doubling up of workflows during the project, everyone knew their tasks.
Great model for projects. Clear accountability, cannot hide!
I did not want to be seen to not achieving, process kept accountability real!
Agree with accountability, didn't want to be "the one" at daily stand-up who had not achieved anything.
Team committed to help each other out as Scrum board, and daily standup created "team affect."
Daily stand-up calls worked surprisingly well, did not impose on day/time, kept everyone informed and accountable.
Agree with above comments re communication and accountable due to standup and Scrum board.
Built accountability to all team members.

PROJECT COMMUNICATION (n=9)

Daily standup was excellent for continuous communication
Good continuous communication throughout project
Loved the open communication and transparency
Clear communicatio, daily stand-up was excellent despite not wanting to do daily meetings.
Increased project and team communication was excellent from daily meeting and scrum board.
Daily stand-ups were surprisingly short yet created continuous communication so process powerful to keep team on track.
Daily stand-up calls worked surprisingly well, did not impose on day/time, kept everyone informed and accountable.
Agree with above comments re communication and accountable due to standup and Scrum board.
Stand-up meeting worked well, communication set tone for day, everyone knew what to do next.

Source: Developed for this research, 2018.

5.2.2   Phase 1: Discussion

Having considered the results, the following themes emerged (1) clarity, (2) accountability, (3) momentum, and (4) the communication tools of the Daily Stand-up and the Scrum Board. The discussion of the results follows the structure of the themes. Notable agreements and notable detractions for each theme are discussed.

Theme 1: Clarity

For the purpose of this discussion clarity encompasses responses including clarity/ transparency/ clear/ no ambiguity and visibility.

What is evident from the participants' responses is the perception that the Scrum process created project clarity. The responses indicated clarity of the project process benefitted the project participants by removing any potential ambiguity of project task progress and created clarity of participants roles associated with those tasks. The responses indicate an emphasis on clarity of communication with numerous references to the resultant communication transparency. Project clarity was evident in responses collated from all five Scrums. The Development Team (DT) members and the Product Owners (PO) referred to the Scrum process creating clarity of project actions and clarity of project status.

There were detracting responses relating to clarity in Scrum #1 relating to the vision being ambiguous which are discussed in detail in the section titled Vision Statement Clarity (p.73).

Theme 2: Accountability

For the purpose of this discussion accountability encompasses responses including accountable/ clear roles / who's doing what / no ambiguity when referenced in the results.

What is evident from the participant's responses, is the process of the daily stand-up, and scrum board have a perceived effect of creating project clarity which led to participants accountability. The responses indicated the Scrum process not only created self-accountability by reducing the ambiguity of tasks, it also created transparency of other team members tasks removing ambiguity in all team members tasks responsibilities. Project accountability was evident is responses from four of the five Scrums. The DT members referred to the Scrum process creating

accountability, more than the PO. There were no detracting responses relating to accountability.

Theme 3: Momentum

For the purpose of this discussion project momentum included responses using the terms momentum/ speed/ quick/ fast/ dynamic. A second set of responses from the results relating to efficacy including no wasted time or effort are included.

What is evident from the responses is DT members perceived the Scrum process created visibility through task updates which had an effect of creating project momentum. The responses indicated momentum was related to the ongoing pace of the projects which was visible through the continuous update of project progress engendered from the Scrum process. There was a further perception from the respondents that the effect of reducing wastage of time from the Scrum process created project efficacy and momentum leading to a perception the Scrum process created overall speed to achieve project results. Project momentum was evident in responses from all five Scrums, including responses from DT members. There were no detracting comments related to momentum in the responses.

Theme 4: Communication and Communication Tools

The theme of communication was consistently referred to in responses from project team members indicating the perception the Scrum process enhances project communication. Common agreement on the responses linked communication to increased project clarity, individual accountability and increased project momentum.

The responses indicated the strength of communication in the Scrum process was perceived to be related to the communication tools of the daily stand-up meeting and the Scrum board. These communication tools were common referred to in the participant's responses, across all five Scrum projects and received the most common number of responses from all the themes, with twenty-seven combined responses making reference to the daily stand-up and the Scrum board.

The Daily Stand up:

The number of positive responses referencing the daily stand-up from the five Scrums indicates the participants agreed the daily stand-up was a communication tool which enhanced project communication, clarity, momentum and accountability.

This is despite the initial reservations on having a daily meeting by project participants, with responses acknowledging their initial negativity to a daily meeting being reversed by the effectiveness of communication engendered by the Scrum process daily meeting. Strengthening the acceptance of the daily meeting was the lack of detracting comments in responses on the daily stand-up meeting.

Many responses grouped the daily stand-up and Scrum board together, which may be explained from the practice of the project teams being encouraged to conduct the daily stand-up around the Scrum board. There was a perception from the responses the combination of conducting the daily stand-up around the Scrum board enhanced communication effectiveness further. There were also some responses focussed on the Scrum board in isolation from the daily stand-up (see below).

The Scrum Board:

The responses indicated a perception the Scrum board was directly related to project momentum by highlighting the visualisation of project task movement across the Scrum board, as well as the continual visual reminder of tasks to be achieved during the project.

In Section 5.2.1 it was noted that in the improvement opportunities there were detracting comments around the visibility of the Scrum board, which are discussed in the next section.

Improvement Opportunities:

A further area of responses outlined in the Phase 1 results, was the improvement opportunities, in response to the sprint retrospective question "What could be improved for the next sprint?" There were two main areas of Scrum process improvement which showed notable agreement from the responses, vision statement clarity and Scrum board visibility.

Vision Statement Clarity:

A number of responses in Scrum #1 indicated the Scrum vision was unclear, creating ambiguity around the final goal and questions around the value of the project output. Interestingly there were differences in perceptions of the clarity of the vision and the project output between the PO and the DTs. Some members of the DT questioned the value of the output, relating this to the ambiguity of the vision statement,

however, the PO perceived a high value project output and also perceived the Scrum process to be a fast project management process to achieve that output.

This difference in perceptions of the PO and DT could be explained by the PO having set the vision. This may have resulted in the PO having a clearer idea in their mind of the vision and the project outcomes, compared to the DT members. Hence, the PO would not require further clarification or be reminded of the vision during the project. The PO response referring to a positive output may also be explained by the broader experience of the Scrum #1 PO, who had been involved in many projects due to his senior position and prior role in the company setting strategic goals.

The Scrum team members for Scrum #1 were the same Scrum team members for Scrum #2, including the PO. Taking the improvement opportunities into consideration, the Scrum Master (SM) spent more time (ninety minutes) with the PO to refine the Scrum #2 vision statement. A further improvement included spending more time at the initial Scrum planning meeting, to dedicate discussion of the project vision and goal with the entire Scrum team. This discussion took thirty minutes, and the DT members changed only two words in the vision statement from this discussion. However, this was enough for the DT members to be aligned with and have ownership with the POs project vision. This practice was repeated for subsequent Scrums. During Scrum #2 and at subsequent Scrums, the vision statement was repeated by the SM at the start of each daily stand-up, as a consistent reminder of the project vision and goal. Lastly, the vision goal was written on the top of the Scrum board as a visual reminder, resulting in subsequent Scrum #2 responses reflecting improvement in project focus and gaol clarity. Furthermore, there were no subsequent detracting responses from the DT members relating to project vision in the responses.

Scrum Board Visibility:
A perception from Scrum #1 was related to the issue of Scrum board accessibility. The response highlighted the Scrum board was not placed in an ideal central location easily accessible to the team. It was suggested and agreed to send an updated picture of the Scrum board daily to the team, allowing them access to the board whether in the office or out of the office during the day as required by their normal day to day

work load. It is noteworthy, and discussed in the limitations Section 5.4, that some of the Scrum team members held sales roles and were required to be out of the office at times the daily stand-up meetings were held.

The Scrum project team who completed Scrum #1 went on to also complete Scrum #2, so the changes to the Scrum board were implemented. The Scrum board was moved to the POs office and was updated in the daily meeting taking place in the office. The POs office was open at all times for Scrum team members to access. Responses from Scrum #2 relating to these changes indicated the team's satisfaction with the accessibility to the Scrum board and in keeping abreast with the updated information.

It is noteworthy to mention why the Scrum board was placed in the PO office and not is a "project room" or central location outside an office. As indicated in the Project Scope Section 3.3.2 and discussed in the limitations Section 5.4, the project team members were from different functional and business areas. Each team member maintained their specific company roles as well as their project team roles. Hence, there was not a dedicated project room as is common with software development Scrum teams, to meet and to display the scrum board.

Detracting Responses:
This section discusses the detracting responses from the Scrum retrospectives, which were noted in section 5.2.1. Phase 1 results.

Scrum #3 Retrospective Meeting:
One of the detracting perceptions of the PO and DT was that insufficient knowledge of Scrum theory and process undermined their full participation and input in the project process. These comments are reflective of the enthusiasm of the Scrum Master who had completed a number of Scrum projects in a short time and did not step back to consider if all Scrum team participants in Scrum #3 had a full understanding of the Scrum process prior to starting the sprint. This was a lesson learned that each Scrum team might have some, or all, new project team members and therefore, the Scrum project should treat the team members as a new team and complete all time-boxed planning activities prior to initiating the sprint.

<u>Scrum #5 Retrospective Meeting: Response (1):</u>

The DT members provided two responses related to the "scope." The first response was related to resistance to changes in the scope during the project sprint phase.

All of the project team members prior experiences were with non-Scrum projects. They were used to adding items/tasks into the scope of a project whenever it was deemed useful. However, in Scrum, once the scope has been defined by agreeing on the sprint backlog, no other tasks can be added during the sprint phase, therefore the scope cannot be altered.

Being a new team, this was the first occasion they had experienced pushback from the PO and Scrum Master (SM), regarding introducing new elements/ideas during the sprint. The PO and SM reiterated only those tasks within the current sprint backlog are in scope during the sprint; nothing can be added. The team was reminded that during the sprint planning meeting the sprint backlog was deemed to be all the tasks required to produce the project product and achieve the goal, therefore adding more tasks into scope during the sprint phase should not, in theory, benefit the project goal.

Discussion on the project goal and product produced does occur after the sprint, in the sprint review meeting with stakeholders and customers. This sprint review meeting is the occasion for new elements/ideas to be introduced and considered by stakeholders and customers if they are necessary to complete the product or add new value to the final product which is deemed important by the stakeholders. Any new elements/ideas would then flow through to the next sprint backlog.

<u>Scrum #5 Retrospective Meeting: Response (2):</u>

The second detracting response was related to the perception that all potential tasks decided in the initial planning may not have been fully explored.

This perception was borne out of the sprint review meeting with stakeholders, where new elements to alter the product were discussed. Scrum aims to produce products in the most efficient way, hence not all possible iterations of a product need to be considered, just those tasks which will produce a viable product, meeting stakeholder and customer requirements. Hence, although many user stories and

associated tasks could be considered during the Scrum planning meeting, only those user stories which lead to a viable product to meet stakeholder/customer needs are considered. The product is reviewed in the sprint review meeting, and potential additions may be added for the next sprint cycle if additions improve the product. Any new elements would become new tasks in the following sprint backlog. However, if the product meets the definition of done and the stakeholders and customers' requirements, then the sprint is completed. Scrum has an evolve or fail fast philosophy, so time is not wasted exploring tasks which may not add value. As explained to the DT members of Scrum #5, this is the Scrum process working as it is designed.

This was a new concept for the Scrum team members to understand. This was an opportunity to remind the teams Scrum aims to produce a viable product, which meets stakeholder and customer expectations, in the shortest amount of time to market. However, they appreciated the philosophy and accepted there was a difference between a viable product which met the stakeholders needs and adding items which may be nice to have, but do not add value to the final product.

5.3   Phase 2: Questionnaire

Section 4on methodology, described the Phase 2 study design consisting of qualitative semi-structured questions and complementary quantitative questions. The identified emerging themes from the Phase 1 responses were used to design the qualitative semi-structured questionnaire which consisted of eight questions related to the emerging themes from Phase 1 (1) Clarity, (2) Accountability, (3) Momentum and (4) Communication tools of the daily stand-up meeting and the Scrum board.

The eight questions were "How does using Scrum create clarity?" "How does Scrum enhance communication?" "How does Scrum enhance momentum?" "How does Scrum create accountability?" "How does Scrum create project speed?" "How does the use of the Scrum board effect the project team?" "What effect does the daily stand-up have on the project team?" "Any other comments regarding Scrum as a project methodology?"

The responses of all the Scrum participants, Product Owners and Development Team members who completed the online qualitative questionnaire

are presented in Section 5.3.1, with all responses collated and grouped separately for each question. Responses were analysed for notable agreement, general themes and notable detractions. A detailed discussion of the responses follows in Section 5.3.2 .

The online survey questionnaire grouped the emerging themes, so qualitative and quantitative questions relating to a specific theme were grouped. Hence the qualitative questions in the online survey were question numbers 4, 7, 10, 13, 16, 18, 20 and 21.

5.3.1 Phase 2: Qualitative Results

Question 4 Responses.

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Question 4: How does using SCRUM create clarity?

Breaking it down into achievable and action-oriented outcomes. Ensuring team commitment and accountability to deliver upon designated actions. Strong momentum ensures information and actions are fresh in mind.

By setting up the scrum team e.g. there is no team leader etc. up front. By investing time up front to define the tasks involved
Using a visual scrum board to track where the project is at Checking in daily, so all team members are accountable, and all know how each task is progressing

Definition of purpose and timeframe

Focusing on every detail that needs completing helps to understand exactly what needs to be completed, with the frequent check ins ensuring

there's no time to procrastinate!

Forces the team to specifically outline what they wish to achieve in order to progress with the project.

By chunking down the work required and getting specific on deliverables

In the SCRUM I was involved in there was a lack of clarity for me. Mainly because the original project question was nebulous.
The process provides clarity on roles, responsibilities and Timelines

Clear process of defining goals. Clear responsibilities reinforced daily - agile but no creep of scope of roles and responsibilities.

Time & action specific

SCRUM structure, especially meeting cadence and accountability brings transparency to individual responsibilities and overall project clarity

By breaking down tactics and determining responsibility from the outset. This helps avoid confusion and conflict.

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The responses to Question 4 highlight notable agreement that the Scrum process breaks down the project work into achievable tasks, with defined goals relating to the general theme of project clarity. Example responses refer to the process "breaking it down into achievable action-oriented outcomes," "chunking down the work required," "focusing on every detail that needs completing," "definition of purpose and timeframe," and "clear process of defining goals." However, a detracting response suggested a lack of clarity related to the project goal discussed in detail in Section 5.3.2.

Question 7 Responses.

Question 7: How does SCRUM enhance communication?

The regularity of meetings, everyone can check in and ensure they understand what needs to be completed and by when.

The stand-up meetings enhance communication. For example, if you have tasks in the barrier column they will be discussed and resolved quickly so as not to slow the project. The stand-up meetings also work well virtually which is great for communication with virtual teams

Regular contact with leader focussed on removal of 'barriers'. Elevates accountability to project tasks

Regular check ins and the 'scrum board'

Forced communication and accountability through the daily stand up meetings. Each member of the project team is given equal time to share exactly how they are progressing with the project.

By restricting the time for communication, it forces streamlined and time-effective communication.

The regular catch ups enhance familiarity with tasks and timelines.

Daily check in ensures communication loops are closed.

Task specific with individual roles assigned.

The nature of SCRUM methodology ensures that there is a high degree of regular (and to the point) communication around project objectives.

By mandating daily communication and reporting, the level of contact regarding a project is enhanced.

The responses to Question 7 highlighted a notable agreement that the daily stand-up meeting created a regular communication cadence which enhanced the overall project communication. Example responses include "The regularity of meetings," " The [daily] stand-up meetings enhance communication," "regular contact," "regular catch ups," "daily check-in," "regular to the point communication," and "daily communication and reporting." These examples highlight the short and clear process of the daily stand-up with "to the point" communication. An example response being, "by restricting the time for communication it forces streamlined and time effective communication."

These responses illustrated an emerging theme that communication is enhanced by the frequency of the daily stand-up meetings. There were no notable detracting comments in the responses. Further discussion of the responses occurs in the discussion Section 5.3.2.

Question 10 Responses.

Question 10: How does SCRUM enhance momentum?

It makes you feel obligated to deliver on tasks at a much quicker pace then you would normally.

The team's commitment to attend daily calls - everyone has a sense of teamwork and there was a strong desire on my part not to let the team down by not attending.

The scrum board keeps team members on track. The stand-up meetings are very powerful in terms of accountability.

The short project timeframes e.g. we can get this done in one to two weeks sets an expectation that we will more quickly.

Awareness and dealing with any barriers as we go greatly enhances momentum.

Short daily catch ups are easy to commit to.

Makes people accountable.

The scrum lead helps to ensure everyone is supported and has regular check-ins to check if anyone needs help.

Through daily check ins, tasks must usually be achieved within a few days before they would become a 'red flag' and alternative actions may be undertaken.

By having more consistent accountable deadlines the project was likely to maintain momentum.

It makes team members more accountable because of the daily reporting.

Daily accountability.

Time bound actions.

SCRUM meeting cadence with embedded accountability to other project team members ensures momentum is not lost.

It requires regular check-ins. This adds a sense of urgency regarding tactics and an onus on executing.

The responses to Question 10 highlighted a notable agreement that the Scrum process led to project momentum and a sense of accountability. There was also agreement the Scrum process led to project transparency, through the daily stand-up meeting and the Scrum board. The responses illustrated an emerging theme that the frequency of the daily stand-up meetings was associated with accountability, which resulted in project momentum. There were no notable detracting comments in the responses. Further discussion of responses occurs in Section 5.3.2.

Question 13 Responses.

Question 13: How does SCRUM create accountability?

It's very transparent if you don't deliver on commitments.

As mentioned above, I felt a strong obligation not to let the team down and so I was highly motivated to complete all tasks on time and attend the daily calls.

The stand-up meetings. The usual board with tasks, we placed initials against the ones we worked on. Asking yourself what you have done to move the project forward is very powerful.

People need to do what they say they will do and it is reinforced continuously. The leader t remove barriers means there should be little stopping people from fulfilling their tasks.

All actions are agreed.

The board and the daily meetings ensured accountability remained with the item owner.

The structure of the task distribution on the SCRUM board and the daily stand up meetings means that there is very high exposure and clarity regarding the tasks that each team member is accountable for.

Regular progress updates.

As discussed previously. Can also feel like harassment.

Team pressure to hold each other accountable.

Assigned tasks.

SCRUM creates accountability because each project team member is required to address how they have and will contribute to project objectives on a regular basis. The SCRUM framework taps into a basic human desire to contribute to a common goal.

Tasks have owners, and owners are held to account. The speed of execution means tasks might be re-allocated. This creates accountability.

The responses to Question 13 indicated notable agreement that the daily stand-up meeting and the Scrum board created ongoing transparency of project team members tasks, which led to increased accountability. The responses illustrated the perception that the daily stand-up and the Scrum board created project transparency which enhanced accountability and led to project momentum. Example responses include "It is very transparent if you don't deliver on commitments," "felt a strong obligation not to let the team down," "asking yourself what have you done to move the project forward," and "team pressure to hold each other accountable."

There was a detracting response suggesting there is a "feeling of harassment." Further discussion of responses occurs in Section 5.3.2.

Question 16 Responses.

Question 16: How does SCRUM create project speed?

Short term mini deadlines for each task ensure the project is always moving at a fast pace.

Regularity of calls/meetings and strong teamwork.

By having all tasks on the board, you know exactly what needs to get done. The visual board motivates you to move all tasks to the right.

High momentum through short daily catch-ups. The ability to suspend activity in line with the project timeline was also effective.

The daily meetings helped ensure forward trajectory constantly.

Speed occurs as a direct result of the increased momentum of the project.

By having aligned goals, regular updates and tight focus.

Agility can increase speed but self-direction (especially when new to process) can lead to delays.

Clear specific actions assigned to team members.

The daily rapid-fire meetings ensure momentum is maintained and progress is quick.

The SCRUM project creates speed by having daily meetings. People are encouraged/pressured to execute ahead of team conversations. This can be positive and negative for the team members. Some tasks in a project aren't required so soon in the project management process - however the process places pressure on the individual contributors.

The responses to Question 16 indicated notable agreement that the frequent daily stand-up meetings created a sense of clarity of project tasks which led to increased project speed/momentum. Example responses included "regularity of calls," "daily meetings," "regular updates," "daily rapid-fire meetings," and "Scrum project creates speed by having daily meetings." These responses illustrated notable agreement of an emerging theme that regular, frequent meetings of the daily stand-up created momentum.

There was, however, a detracting response suggesting the Scrum process places pressure on team members. Further discussion of responses occurs in Section 5.3.2.

Question 18 Responses.

Question 18: How does use of a SCRUM Board affect the project team?
The idea of having a visual up for all to see, reminds people of commitments made and also drives you as you want to see more moved to the completed column. It is quite fulfilling having the visual.
Creates accountability, clarity, speed in a project
Effective but some confusion re: classification of tasks on the continuum.
you need only look to the board to check in on the project, know who owns any given task.
It provides a consistent means for each team member to see how the project is tracking without much room for confusion or miscommunication regarding where the project is headed.
It allowed for easy/transparent updates and a point of focus.
Might be more helpful for the coordination.
Visibility, transparency.
NA
It distils project status and can simplify complex project multitasks.
Visual aid

The responses to Question 18 indicated notable agreement the Scrum board created visibility/transparency of project tasks. Example responses included "creates accountability, clarity, speed," "reminds people of commitments," "look at the board to check on the project," "visibility, transparency," and "visual aid." These responses illustrated agreement on an emerging theme of clarity associated with the Scrum board. There was a response which suggested there was some confusion relating to task classification. Further discussion of responses occurs in Section 5.3.2.

Question 20 Responses.

Question 20: What effect does the "Daily Stand-up" have on the project team?
Holds you accountable. It's also great to bounce things off the time. The idea of it being quick with no small talk is a nice change!
Again, it ensures momentum and accountability.
Accountability! You don't want to be the one who has not pulled their weight.
accountability, speed and momentum. Everyone can spare 15 minutes to think about a project - it is often harder to dedicate hour/s.
Motivates and makes people take action on agreed tasks.
helps to keep yourself and the team in check and forward moving.
It keeps the project front of mind for all team members and it imparts a feeling of commitment and team work through the project team through seeing all team members turning up and reporting daily.
Remind and refocus the team on the required activities.
As stated it helps communication and clarity and speed, but can feel like harassment and assumes the most important priority in your day This is the key factor to communication and accountability.
Issues identified quickly.
The daily stand-up creates a sense of urgency on project deliverables. knowing that you are going to have to describe to your team what you did yesterday and what you will do now creates accountability and is a strong call to action.
It involves all team members. Ordinarily, I would not have an opportunity to connect with all members of a team as my Manager would participate. As a contributor and responsible for execution I feel this is effective.

In the responses to Question 20 notable agreement emerged that the daily stand-up meeting created visibility of individual tasks which led to accountability.

A further notable agreement emerged relating to the frequency of the daily meetings and of momentum, described by one team member as "creating a sense of urgency." These responses illustrated the frequency of the daily stand-up meeting led to accountability and increased project momentum.

There was a detracting response suggesting although the daily stand-up enhanced communication and clarity, there was also a sense of "harassment" from the daily communication. Further discussion of responses occurs in Section 5.3.2.

Question 21 Responses.

Question 21: Any other comments regarding SCRUM as a project methodology?

Loved it - would like the opportunity to be involved in another SCRUM managed project again.

The simplicity is a key factor to the success of Scrum in my opinion.

I really like the idea of bringing in experts within the process to add value at appropriate times. It is a concept I have raised in other meetings also really enjoyed the methodology.

SCRUM is a great project methodology for projects that you want completed quickly, efficiently and simply.

I believe the SCRUM methodology would be less effective in projects that require more complexity and time because if held for a long period of time (i.e. 2 months or more) the daily stand ups may become more draining that momentum building.

Scoping projects correctly is vital to scrum methodology to be effective.

No

It should be more broadly utilised.

I believe a digital SCRUM board would be an effective tool in supporting the stand-up meetings.

The responses to Question 21 indicated notable agreement that a key feature of the Scrum process is its simplicity and its methodology. There was agreement Scrum is a useful project methodology. These responses illustrated a broad acceptance of the Scrum project management process. A response, however, suggested Scrum may not be effective in more complex, longer projects. Further discussion of responses occurs in Section 5.3.2.

5.3.2   Phase 2: Qualitative Discussion

The emerging themes identified in Phase 1 created the basis of the questionnaire design for Phase 2 to further investigate the themes. The emerging themes were (1) Clarity (2) Accountability (3) Momentum and (4) Communication Tools of the daily stand-up and the Scrum board. This discussion explores the relationship between Phase 1 and Phase 2 themes and highlights any variations in the themes in Phase 2 responses. The structure of this discussion follows the sequence of the emerging themes.

Theme 1: Project Clarity:

Phase 1 identified perceptions from Scrum team members that the Scrum process created clarity. This theme was explored further in the Phase 2 questionnaire by asking the Scrum team members how the Scrum process created clarity. The responses identified the Scrum process "breaks down" the project into achievable outcomes with defined goals. The responses also highlighted the Scrum process creates visibility and transparency around individual responsibilities, agreeing with the theme of clarity. These results illustrate the Phase 2 responses of the Scrum team participants agree with the Phase 1 responses, which strengthens the perception that the Scrum process creates project clarity.

The responses in the Scrum #1 retrospective meeting did include a detracting perception that there was a lack of clarity in Scrum mainly because the original project vision was ill-defined This detracting perception was followed by a positive perception that the Scrum process provided clarity on roles, responsibilities and timelines. These two perceptions appear to reflect project vision ambiguity, rather than Scrum process. Steps to improve the vision/goal clarity were discussed along with a request for ongoing reference to the vision during the sprint. Changes were implemented to improve the project vision and frequency of reference to the vision, including (1) refining the project vision with the PO, (2) spending more time with the Scrum team in the planning meeting to discuss the vision, (3) referring to the vision at the start of each daily stand-up meeting and (4) writing the vision at the top of the Scrum board. Once these changes were implemented, no further commentary regarding vision ambiguity was evident in in Scrum 2 through to Scrum 5. The feedback through the retrospective meeting and the subsequent discussion regarding potential improvement opportunities illustrated the benefit of the retrospective in identifying opportunities to continually improve the Scrum process.

Theme 2: Project Accountability:

Phase 1 identified perceptions from Scrum team members that the Scrum process created accountability among the project team members. The theme of accountability was further investigated in the Phase 2 questionnaire with Question 13 " How does Scrum create Accountability?" The responses indicated the Scrum process created transparency of individuals tasks through the communication tools of the daily stand-up meeting and the Scrum board, which led to increased accountability. The

perceptions of the project participants in Phase 2 were in agreement with the phase 1 responses. These results strengthen the perception that the Scrum process created accountability among the project team members.

There was a detracting comment on harassment in Question 13. However, in Question 20, there was a fuller response relating to the feeling of harassment related to the transparency of the daily stand-up meeting. It is discussed in detail under Detracting Responses (page 75).

Theme 3: Project Momentum:

Phase 1 identified perceptions from Scrum team members that the Scrum process created project momentum. The theme of project momentum was further investigated in the Phase 2 questionnaire. The Scrum team members were asked in question 10 "How does Scrum process enhance momentum?" The responses illustrated the perception that momentum is the result of accountability which the Scrum process brings through the transparency and frequency created by the daily stand-up meeting and Scrum board. This perception of the participants from the Phase 2 questionnaire is in agreement with the Phase 1 responses. This perception strengthens the premise that the Scrum process creates project momentum.

The key terms in the responses related to momentum in Phase 1 included, "quick, fast, pace." Therefore, project momentum was investigated further in Phase 2 through Question 16, asking how Scrum created project speed. Example responses from phase 2 corroborated with those in phase one with key words including "short daily catch-ups, quick progress, and clarity of purpose." The emphasis on these key words in Phase 2 further strengthened the notion that the Scrum process creates project momentum.

Theme 4: Communication Tools:

Phase 1 identified perceptions from Scrum team members that the communication tools of the daily stand-up meeting and the Scrum board were related to project clarity, accountability and momentum.

The Daily Stand-up Meeting:

In phase 2 the Scrum teams perceptions of the daily stand-up meeting were further investigated by Question 20 "What effect does the daily stand-up have on the project

team?" The notable common theme of clarity relating to the daily stand-up was repeated in the Phase 2 responses. Perceptions such as daily team meetings build clarity of purpose, keep the team refocused on the required tasks, and enhances communication that helps in quick identification of issues substantiated the notion that communication is an important aspect of Scrum process that increases knowledge and understanding related to project issues, brings clarity for meaningful changes and allows the team to stay focused to achieve the given tasks.

The second emerging theme of accountability related to the daily stand-up was also repeated in the Phase 2 responses. The perceptions of the team were that the daily stand-up meetings engendered accountability and kept the team members on their feet and take action proactively. Momentum, the third emerging theme, related to the daily stand-up was also repeated in the responses indicating the daily stand-up provided motivation for action to deliver project tasks and the Scrum process provided continual momentum via a sense of urgency.

It is apparent from the perceptions of the project team members in Phase 2 that the daily stand-up meeting is closely related to the emerging themes of clarity, accountability and momentum. These results are consistent with the phase 1 results.

There was one detracting perception in Question 20 that although the Scrum stand-up meetings helped communication, clarity and speed, there was an element of harassment. This comment is discussed in detail in the section Detracting Responses (page 85).

The Scrum board:

In Phase 2 the Scrum teams perceptions of the Scrum board were further investigated by Question 18 "How does use of a Scrum Board affect the project team?" From the Phase 2 responses, the notable common theme relating to the Scrum board was clarity, with the use of words like "visibility," and "transparency." The responses indicate a perceived benefit of the visualisation of the project from the Scrum board. The project clarity as a result of this visualisation was associated with both individual and team accountability. The responses indicate the Scrum board reduced the opportunity for miscommunication.

The perceptions analysed in Phase 2 mirrored the perceptions of the Scrum team members in Phase 1. The agreement of responses between the phases

strengthens the concept that the Scrum process related to the Scrum board creates clarity among the project team members.

It is notable that of the thirteen study participants only eleven responded to Question 18, "How does the use of Scrum affect the project team?" The perception that the Scrum board created clarity was restricted to eight responses. Two participants failed to respond at all. One perception was unclear relating to coordination. Another detraction noted was the perception that Scrum was effective but created confusion of clarity when tasks were reclassified on the Scrum board. This perception did not emerge in the sprint retrospective, nor in any daily stand-up responses, indicating that there was a lack of clarity in reading the Scrum board as indeed the opposite of clarity is confusion.

A perception emerged the Scrum process places pressure on the individual contributors. This response is discussed below in the Detracting Responses section.

These mixed perceptions on Scrum board indicate that Scrum board might not create clarity across the team but could create confusion for some team members. Further investigation into the efficacy of the Scrum Board is required in future studies.

Detracting Responses:

This section discusses the detracting responses which have been noted in the previous sections.

From the Phase 2 questionnaire, Question 13 and Question 20 were two detracting perceptions related to "harassment" and "accountability" in the daily stand-up. These two detracting perceptions are important to consider which may also relate to similar detracting comments noted in the feedback from questions 10, 13 and 20 in the Phase 2 questionnaire. The responses from these questions give a perception the high level of accountability from the Scrum process can lead to some team members feeling obligated and even harassed. Hence, in contrast the general perceptions of the Scrum team members identifying emerging themes of project clarity and individual accountability resulted in one or more team members perceiving clarity and accountability as a threat, with the strong use of the word

"harassment." Although the Scrum process seems to suit many of the participants, for some individuals to feel harassed is neither ideal nor acceptable.

Eppler et al. (2009) cautioned of issues which may arise with the visualisation communication tools when they suggest participants may see risk due to the transparency of their contributions, possibly leading to participants being less forthcoming. Although the Scrum process employed reflected the participant's suggestion to address this challenge through project facilitation combining accurate narrative (daily stand-up) and visualisation messaging in the Scrum board, even good facilitation may not help with issues dependent on the workplace social, cultural and political environment (Eppler & Platts, 2009).

The researcher assumes that this negative perception may have emerged in Scrum #3 where the Scrum process needed further explaining at the beginning, as already perceived by some participants. Or it could be reflective of perhaps a personality type, specific job practice, e.g. an engineer compared to a salesperson who may have different communication styles and experiences.

As suggested by Eppler et al. (2009) further research in this area is important to investigate when visualisation techniques may be counterproductive, and what effect does the social and cultural organisational environment have? Furthermore, research investigating personality types and or job descriptions which may not respond well to high levels of accountability may be useful.

From Question 16, "How does Scrum create project speed," a perception relating to speed/momentum had detracting elements. One respondent perceived the daily stand-up meetings created pressure, which could be interpreted as positive or negative. The response suggests a perception that the pressure to execute a task may be misaligned to the time required to complete that particular task. The theme of this question may also relate to the detracting perception suggesting pressure to the level of "harassment" due to the high level of accountability. This finding indicates that the Scrum process within a small team limits the opportunity for social loafing and the high standards of accountability in Scrum disrupt the comfort level of the team. Scrum #5 specifically fits well with these detracting perceptions as the team had a hard deadline of one month to complete the project. The Scrum team was efficient in delivering the required project tasks within two weeks (two sprints). The feedback

from the PO indicated that that one of the team members felt the tasks could have been spread out over a longer period to reduce the workload endorsing the detracting perceptions discussed above.

It is also worthy to make note that each Scrum team member, including PO and DT, were not exclusively spending their time on the study projects, (this is also discussed in the limitations section). Each team member maintained their roles within their functional area or business unit, with normal daily responsibilities to that function or role. The time spent as a member of the Scrum team was over and above their normal workload. This is in contrast to Scrum teams in the software development industry who are dedicated solely to the projects they are members of. This may be another factor which contributed to the comments in Question 16 and even Questions 13 and 20 relating to harassment. It may be some individuals were under undue pressure with their normal roles combined with the Scrum projects. It may be interesting in future research to measure the stress levels of individuals related to the workload and how it affects the level of accountability they feel through the Scrum process.

A response from Question 21 is worthy of further discussion. The response was "I believe the Scrum methodology would be less effective in projects that require more complexity and time because if held for a long period of time (i.e. 2 months or more) the daily stand-ups may become more draining than momentum building." Although this comment has merit in the context of the project teams in this study as discussed above in terms of extra workload, further study of Scrum use with full-time project teams undertaking large complex projects would be of interest.

5.3.3   Phase 2: Quantitative Results

The Phase 2 quantitative results are presented in two tables. Table 11 (p.88) displays the frequency results. Table 12 (p.90) displays the correlation results. In this section, the results will be presented by following the themes in Phase 1 and Phase 2. These themes are (1) clarity, (2) accountability (3) momentum and (4) communication tools of the daily stand-up and Scrum board. The quantitative frequency results will be presented first, followed by the quantitative correlation results. Discussion of both these results follows in Section 5.3.4.

5.3.3.1   Phase 2: Quantitative Frequency Results

Quantitative frequency results are summarised in Table 11.

Table11: Survey Quantitative Questionnaire Frequency Results

Question	Number Responses	Standard Deviation	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agreement
Q2: SCRUM is effective as a methodology to create project clarity among the project team.	13	0.70	0	0	15.4%	46.2%	38.4%
Q3: SCRUM is more effective in enhancing project clarity than other project methodologies you have used.	13	0.78	0	7.7%	7.7%	61.5%	23.1%
Q5: SCRUM is more effective in enhancing project communication than other project methodologies you have used.	13	0.58	0	0	7.7%	61.5%	30.8%
Q8: SCRUM is more effective in enhancing project momentum than other project methodologies you have used?	13	0.61	0	0	7.7%	53.8%	38.5%
Q12: SCRUM is more effective in enhancing accountability of team members than other project methodologies you have used?	13	0.74	0	0	15.4%	30.8%	53.8%
Q15: SCRUM is more effective in enhancing project speed other project methodologies you have used?	13	0.61	0	0	7.7%	53.8%	38.5%
Question	Number Responses	Standard Deviation	Least Effective	Less Effective	Undecided	Effective	Most Effective
Q6: On a scale of 1-5 rank the effectiveness of a SCRUM as a methodology to enhance communication among the project team.	13	0.61	0	0	7.7%	53.8%	38.5%
Q9: On a scale of 1-5 rank the effectiveness of a SCRUM as a methodology to enhance momentum among the project team.	13	0.66	0	0	15.4%	53.8%	30.8%
Q11: On a scale of 1-5 rank the effectiveness of SCRUM as a methodology to create accountability among the project team.	13	0.63	0	0	7.7%	38.5%	53.8%
Q14: On a scale of 1-5 rank the effectiveness of SCRUM as a methodology to create project speed.	13	0.61	0	0	7.7%	53.8%	38.5%
Q17: On a scale of 1-5 can you rank the effectiveness of using a SCRUM Board to enhance communication within a project team.	12	0.92	0	8.3%	33.3%	33.3%	25%
Q19: The "Daily Stand-up" is effective in enhancing communication within a project team?	13	0.50	0	0	0	53.8%	46.2%

Clarity: Questions 2 and 3 were related to the theme of the Scrum process enhancing project clarity among the project participants. At least 84% of respondents agreed or

strongly agreed that more project clarity was achieved with the Scrum framework. However, 15.4% of respondents were undecided or disagreed that the Scrum framework was effective to enhance project clarity.

Accountability: Questions 11 and 12 were related to the theme of the Scrum process enhancing project accountability among the project team. At least 84% of respondents agreed or strongly agreed that project accountability was enhanced with the Scrum process. However, 15.4% of respondents were undecided if the Scrum process was effective in enhancing project accountability.

Momentum: Questions 8 and 9 were related to the theme of the Scrum process enhancing project momentum. At least 84% of respondents agreed or strongly agreed that project momentum was enhanced with the Scrum process. However, 15.4% of respondents were undecided if the Scrum process was effective in enhancing project momentum.

Speed: Questions 14 and 15 were related to the theme of the Scrum process being effective in enhancing project speed. At least 92% of respondents agreed or strongly agreed that project speed was enhanced with the Scrum process. However, 7.7% of respondents were undecided if the Scrum process was effective in enhancing project speed.

Communication: Questions 5 and 6 were related to the theme of the Scrum process in enhancing communication among the project participants. At least 92% of respondents agreed or strongly agreed that project communication was enhanced with the Scrum process. However, 7.7% of respondents were undecided if the Scrum process was effective in enhancing project communication.

Scrum Board: Question 17 was related to the effectiveness of the Scrum board in enhancing communication within a project team. At least 57% of respondents agreed or strongly agreed that project communication was enhanced with the Scrum board. However, 41.6% of respondents were undecided or disagreed that the Scrum board was effective in enhancing project communication.

Daily Stand-up Meeting: Questions 19 was related to the effectiveness of the daily stand-up meeting in enhancing communication within a project team. All

respondents, 100%, agreed or strongly agreed the daily stand-up meeting enhanced project communication within a project team.

5.3.3.2 Phase 2: Quantitative Correlation Results

Table 12: Intercorrelations, Means, Standard Deviations for Scrum Clarity, Communication, Accountability, Momentum, Daily Stand-up & Scrum Board.

	MEASURE	1	2	3	4	5	6	7	8	9	10	11	12	M	SD
1	Create Project Clarity	-	.704**	.443	.196	.196	.090	.455	.426	.379	.379	.458	.136	4.23	.725
2	More Effective at Enhancing Project Clarity	.704**	-	.170	.162	.486	.148	.309	.399	.486	.486	.551	.393	4.00	.816
3	More Effective at Enhancing Project Communication	.443	.170	-	.679*	.238	.109	.340	.515	-.204	-.204	.404	.433	4.23	.599
4	Enhance Project Communication	.196	.162	.679*	-	.581*	.458	.631*	.768**	.161	.161	.417	.803**	4.31	.630
5	More Effective at Enhancing Project Momentum	.196	.486	.238	.581*	-	.650*	.231	.596*	.581*	.581*	.274	.803**	4.31	.630
6	Enhance Project Momentum	.090	.148	.109	.458	.650*	-	.014	.194	.458	.458	.321	.717**	4.15	.689
7	Create Project Accountability	.455	.309	.340	.631*	.231	.014	-	.771**	.231	.231	.325	.299	4.46	.660
8	More Effective at Enhancing Project Accountability	.426	.399	.515	.768**	.596*	.194	.771**	-	.252	.252	.252	.563*	4.38	.768
9	Create Project Speed	.379	.486	-.204	.161	.581*	.458	.231	.252	-	1.000**	-.011	.294	4.31	.630
10	More Effective at Enhancing Project Speed	.379	.486	-.204	.161	.581*	.458	.231	.252	1.000**	-	-.011	.294	4.31	.630
11	Enhanced Communication through Scrum Board	.458	.551	.404	.417	.274	.321	.325	.252	-.011	-.011	-	.587*	3.77	.927
12	Enhanced Communication through Daily Stand-up	.136	.393	.433	.803**	.803**	.717**	.299	.563*	.294	.294	.587*	-	4.46	.519

** Correlation is significant at the 0.01 level (2 tailed)

* Correlation is significant at the 0.05 level (2 tailed)

A correlation analysis was conducted for the quantitative data from the Phase 2 questionnaire. The reported statistical significance is at 0.95 and 0.99 significance levels. Table 12 illustrates the results of the correlation analysis; the following correlations were significant.

At the 0.95 level the statistically significant relationships were found between:

Question 4: Enhancing project communication and Question 3: More effective at enhancing project communication, at 0.68 statistical significance.

Question 4: Enhancing project communication and Question 5: More effective at enhancing project momentum, at 0.58 statistical significance.

Question 4: Enhancing project communication and Question 7: Create project accountability, at 0.63 statistical significance.

Question 5: More effective at enhancing project momentum and Question 6: Enhance project momentum, at 0.65 statistical significance.

Question 5: More effective at enhancing project momentum and Question 8: More effective at enhancing project accountability, at 0.59 statistical significance.

Question 5: More effective at enhancing project momentum and Question 9: Create project speed, at 0.58 statistical significance.

Question 5: More effective at enhancing project momentum and Question 10: More effective at enhancing project speed, at 0.58 statistical significance.

Question 8: More effective at enhancing project accountability and Question 12: Enhanced communication through daily stand-up, at 0.59 statistical significance.

Question 11: Enhanced communication through scrum board and Question 12: Enhanced communication through daily stand-up, at 0.59 statistical significance.

At the 0.99 level the statistically significant relationships between:

Question 4: Enhancing project communication and Question 8: More effective at enhancing project accountability, at 0.77 statistical significance.

Question 7: Create project accountability and Question 8: More effective at enhancing project accountability, at 0.77 statistical significance.

Question 9: Create project speed and Question 10: More effective at enhancing project speed, at 1.0 statistical significance.

Question 12: Enhanced communication through daily stand-up and Question 4: Enhancing project communication, at 0.80 statistical significance.

Question 12: Enhanced communication through daily stand-up and Question 5: More effective at enhancing project momentum, at 0.80 statistical significance.

Question 12: Enhanced communication through daily stand-up and Question 6: Enhance project momentum, at 0.72 statistical significance.

5.3.4   Phase 2: Quantitative Discussion

From the Phase 1 qualitative analysis, four emerging themes were apparent. These informed the qualitative analysis of Phase 2 with responses confirming the four themes. Phase 2 quantitative results are discussed below. The quantitative frequency results are discussed first, followed by the quantitative correlation results. The results discussion structure follows the four themes of (1) clarity,

(2) accountability, (3) momentum and (4) communication tools of the daily stand-up meeting and the Scrum board.

5.3.4.1 Phase 2: Quantitative Frequency Discussion

<u>Clarity :</u>

Questions 2 and 3 were related to the theme of project clarity. From Phase 1 and Phase 2 qualitative results, it can be deduced that clarity generally increased with the use of the Scrum framework. The frequency results of the quantitative data seem to confirm this with generally more than 84% of the sample agreeing and strongly agreeing the Scrum process was effective in creating project clarity and was more effective in creating project clarity than other project methodologies the study participants had used.

However, it is noted from Question 2 that 15% of the sample was undecided or disagreed that the Scrum process was effective to enhance project clarity. This result may be due to the ambiguity of the vision/gaol noted in the detracting comments related to Scrum #1. Responses from Scrum #1 also questioned the Scrum output, with a further response related to the Scrum board needing to be more visible. These responses demonstrated a lack of clarity which may explain the undecided or disagreement statements in quantitative results.

These results may also be due to study participants experiences with another project methodology which they believe created more clarity. Alternatively, the results could be due to a lack of exposure to other project methodologies, giving no comparative base to judge the Scrum process by. It is also possible that this disagreement highlights some people did not like working with the level of visibility/clarity which the Scrum process brings to a project. Further discussion of the research results with participants may have been useful to understand these gaps. Hence it is suggested a follow-up phase should be considered for future research.

Future research in the area of transparency/visibility with associated accountability related to the Scrum process would be important to assess the level of comfort of project participants. Does the level of accountability detract or assist in individual motivation and project momentum? Is there a tipping point where momentum declines? Are there personality types who respond better or worse to high levels of transparency and accountability?

<u>Accountability:</u>

Questions 11 and 12 relate to the theme of accountability. From Phase 1 and Phase 2 qualitative results, it can be deduced that accountability was generally increased by use of the Scrum framework. The frequency results of the quantitative data seem to confirm this with generally more than 84% of the sample agreeing and strongly agreeing Scrum was effective to create accountability and was more effective in creating accountability than other project methodologies the study participants had used.

It is noted from Question 12 that 15% of the sample was undecided or disagreed that the Scrum framework was effective to enhance accountability. It is unclear from the results why 15% of the participants perceived Scrum was not effective in enhancing accountability, it would be useful tom study this in more details in future research.

It is possible the Scrum process itself could have an unintended effect on an individual's perception of accountability as each task was regularly updated through the daily stand-up meeting and on the Scrum board. However, some tasks may take longer than others, so were in progress, yet show in the doing column on the Scrum board. These tasks may be seen as not moving forward, creating false visibility that work was not progressing.

The responses in the survey were not entirely a surprise to the researcher, however, who was approached after the retrospective of Scrum #5 by the PO, who noted one of the Scrum team members felt under pressure in the daily stand-up to perform and felt uncomfortable due to the pressure of the team. Scrum #5 team was unique in the study; the team was already formed prior to the Scrum master being invited to take on the project. This was in contrast to the prior four Scrums where the project team members were identified after the vision statement was finalised.

As discussed in the methodology, the ideal practice is to form a team around the vision/goal to have the right skills to complete the project. Potential team members are informed of the Scrum process before agreeing to join a team, so have some visibility to the level of accountability in the Scrum process.

In the case of Scrum #5 team, the team was already formed, so participants were not in an "opt-out" situation. One of the team members had been in a prior Scrum in the study which suggested Scrum methodology would be useful for the Scrum #5 project. Despite the team already being formed, the researcher agreed to take the role of Scrum master and include Scrum #5 in the study. The results highlight the study has uncovered responses important to consider for future projects and future research in this area. Future research could investigate perceptions of "tailored" Scrum teams that are formed around a specific vision and compare them to perceptions of projects teams who then take on a Scrum framework process after the Scrum team has been formed.

Third, the part of the response which stated, "and assumes the most important priority in your day," relates directly to the prior explanation that the project team members held responsibilities in other functions and tasks during the projects. Their project work was on top of their normal daily responsibilities. Hence during this study, the daily stand-up meetings and Scrum board may have added undue pressure to an already full workload. This is a limitation of the study as outlined in the limitations Section 5.4. Future studies might investigate dedicated Scrum team members perceptions of workload pressure associated with transparency and accountability.

Momentum:
Questions 8 and 9 relate to the theme of momentum. From Phase 1 and Phase 2 qualitative results, it can be deduced that project momentum was generally increased by use of the Scrum framework. The frequency results of the quantitative data seem to confirm this with generally more than 84% of the sample agreeing and strongly agreeing Scrum was effective to create project momentum, and 92% more effective in creating momentum than other project methodologies the study participants had used.

It was noted from Question 9 that 15% of the sample was undecided or disagreed that the Scrum process was effective to enhance momentum. From the prior discussion on accountability, Section 5.3.4.1, some people did not like working with full transparency/clarity of what they were working on. Further investigation of the results with the project team members might have been useful in understanding

this relationship. Future research to understand the relationship between momentum and accountability within Scrum projects may be useful.

Momentum was also investigated in Questions 14 and 15 relating to project speed. The frequency results of the quantitative data seem to confirm this with generally more than 92% of the sample agreeing and strongly agreeing the Scrum process was effective in creating project speed, and 92% more effective in creating speed than other project methodologies the study participants had used.

Undecided responses accounted for 7.7%. The qualitative results for speed referenced the frequency of meetings and regular updates. However, no mention of accountability occurred in the qualitative responses to Phase 2 Question 16, relating to project speed. This is in contrast to the number of qualitative responses mentioning accountability in Phase 2 Question 10, relating to project momentum.

Communication Tools

Daily Stand-up:

Question 19 related to the daily stand-up. In Phase 1 and Phase 2 qualitative results the daily stand-up was considered an effective communication tool in increasing project clarity, momentum and accountability. The frequency results of the quantitative data seem to confirm this with 100% of the sample agreeing or strongly agreeing the daily stand-up was effective in enhancing communication within a project.

Scrum Board:

Question 17 related to the Scrum board. In Phase 1 and Phase 2 qualitative results, it can be deduced that the Scrum board was generally effective as a communication tool, however there were detracting comments on the visibility of the Scrum board in the Phase 1 results. The Phase 2 results indicated general agreement the Scrum board created visibility, however there was comment relating to confusion of task classification. The frequency results of the quantitative data show over 57% of respondents agree the Scrum board was effective to enhance communication within a project team. A further 33% of respondents were undecided, and 8.3% of the sample seemed to disagree that they liked the Scrum board as a tool. This gives a total

response of 41% of the sample were undecided or disagreed that Scrum board was effective in enhancing communication.

These results may be explained by the qualitative results in Phase 2 which illustrated a response of perceived negativity related to the clarity and associated accountability from this visualisation communication tool. The comments highlighted a feeling of harassment and obligation by at least one respondent. The quantitative results may indicate further project team members felt similarly.

It is possible that the visualization and writing on the Scrum board could have lacked clarity creating this negative response among participants It is also possible that this disagreement highlights some people do not like working with full visibility/clarity of what they are working on which the Scrum board illustrates. The Scrum board was less visible in the first Scrum which could have attributed to the results.

A further likely factor is the respondents might have compared the Scrum board to the daily stand-up as a communication tool, which received 100% positive response, scoring the Scrum board less in comparison. It is unclear why the Scrum board scored poorly compared to all other emerging themes; therefore, further discussion on the results would be useful to understand this deviation. What may be important, however, is an investigation of the Scrum board as a communication tool in future studies.

5.3.4.2   Phase 2: Quantitative Correlation Discussion

Clarity:

From Phase 1 and Phase 2 qualitative results, it was deduced that project clarity was generally increased by use of the Scrum framework. The correlation results of the quantitative data did not show a statistically significant relationship of clarity with any other emergent theme. This is a surprising result considering the consistent responses to clarity in both Phase 1 and Phase 2 qualitative responses and Phase 2 quantitative frequency result of 84% of the sample agreeing and strongly agreeing Scrum was effective to create project clarity.

Accountability:

From Phase 1 and Phase 2 qualitative results, it was deduced that accountability was

generally increased by use of the Scrum framework. The correlation results of the quantitative data show a statistically significant relationship ($p = 0.63$) between accountability (Question 7) and communication (Question 4) in the Scrum project framework. This statistically significant relationship between accountability and communication was further highlighted in the statistically significant relationship ($p = 0.77$) between enhanced communication (Question 4) and Scrum being more effective in enhancing accountability than other project methodologies (Question 8). The statistically significant relationship between communication and project accountability may be explained by the use of communication tools such as the daily stand-up meeting and the Scrum board. These two Scrum tools enabled visual and verbal communication frequently (at least daily), highlighting who was doing what and what progress the team was making. This transparency in communication created the opportunity for enhanced accountability.

 Momentum:

From Phase 1 and Phase 2 qualitative results, it was deduced that momentum was generally increased by the use of Scrum framework. The correlation results of quantitative data showed a statistically significant relationship ($p = 0.58$) between Scrum being more effective in enhancing project momentum (Question 5) and enhanced communication (Question 4). This statistically significant relationship between communication in enhancing project momentum may be explained by the frequency of communication occurring in the Scrum framework. This was highlighted by the statistically significant relationship ($p = 0.72$) between project momentum (Question 6) and the daily stand-up meeting (Question 12), which is a communication tool in the Scrum framework. Further, correlation results showed statistically significant relationship (p = 0.80) between the daily stand-up meeting (Question 12) and the Scrum being more effective in enhancing momentum than other project methodologies (Question 5). It may be surmised that enhanced communication from the frequency of daily stand-up led to increased momentum.

Project momentum also had statistically significant relationship with project speed. From Phase 1 and Phase 2 qualitative results, it was deduced that the emergent theme of project speed was generally increased by use of the Scrum framework. The correlation results of the quantitative data show a statistically significant relationship ($p = 0.58$) between enhanced project momentum (Question

5) and creating project speed (Question 9). This statistically significant relationship between momentum and project speed was further highlighted in the statistically significant relationship ($p = 0.58$) between enhanced project momentum (Question 5) and Scrum being more effective in enhancing project speed than other project methodologies (Question10). The statistical relationship between momentum and speed can be explained considering their similar nature, with project gaining momentum leading to the increased speed of the project.

Communication Tools:

From Phase 1 and Phase 2 qualitative results, the emergent theme of communication tools used in the Scrum framework included the daily stand-up meeting and the Scrum board.

Daily Stand-up Meeting:

The correlation results of the quantitative data show a statistically significant relationship between the daily stand-up meeting and a number of features of the Scrum framework including momentum, accountability, and communication. The relationship between the daily stand-up meeting and momentum has already been examined above. There was also a statistically significant relationship ($p = 0.56$) between the Daily stand-up meeting (Question 12) and enhanced accountability (Question 8). Furthermore, there was a statistically significant relationship ($p = 0.80$) between the Daily stand-up meeting (Question 12) and enhanced communication (Question 4). The frequency of the daily stand-up meeting, combined with the structured questions allowed each team member to be continually updated on the project status, which enhanced communication and reduced barriers to project momentum. The nature of the daily stand-up meeting with each team member giving a verbal update also promoted individual accountability, further increasing the project momentum.

Scrum Board:

There was one statistically significant relationship ($p = 0.59$ between the Scrum board (Question 11) and the daily stand-up meeting (Question 12). The correlation results of the quantitative data did not show a statistically significant relationship between the Scrum board and any other emerging themes. This result was consistent

with the quantitative frequency data and has been discussed in the frequency results above.

5.4 Limitations

This case study has a number of limitations. Limitations of the literature search relate to the approach used for identifying current literature, such as keywords used, and search procedure may not have provided a complete picture, despite being based on an understanding of the popular theoretical perspectives.

This case study investigated the perceptions of project participants in implementing Scrum project framework in a single organisation. Hence results may not be transferable to other organisations, with or without a similar siloed structure. The case study took place in a medical technology sales organisation, Techco, so the results may not translate to organisations outside the medical technology industry.

The researcher chose to narrow the scope of individuals involved in the case study projects to the Techco organisation Sydney head office. The narrow scope was to co-locate Scrum project teams to a single location. The results obtained are therefore relevant for individuals in the Sydney office rather than outside the Sydney office. Further studies could look at distributed and virtual project teams to further test the applicability of the Scrum frameworks effectiveness.

Despite promising survey findings, due to practical limitations, this study relied on a relatively small sample, which may have resulted in sampling errors. The small number of participants can influence the quality of conclusions and the true strength of relationships in the quantitative data. Therefore, the results obtained may not be an accurate representation of the wider organisation.

The results relate to the relatively small number of five projects, comprising a case study. Projects undertaken focussed on internal organisational problems to be solved, not involving external customers or stakeholders. Therefore, results obtained are representative of internal organisational projects only. Further, research involving external customers ideally as the stakeholders or in the Product Owners role would be useful to investigate the Scrum process. In this situation, the Scrum framework between provider and supplier organisations could test the effectiveness of the Scrum process in inter-company communication, decision making, negotiation, and or

responsiveness. Exploration of more companies across a wider set of projects and a more in-depth detailed data collection is encouraged in subsequent research.

A limitation of the study was the part-time nature of the Scrum team members in the five projects that made up this case study. In all five Scrums the project teams were part-time. That is, each project team member, including PO, DT and SM had positions in the company which were not specific to the Scrum projects. Each person involved with the case study held responsibilities in other functions and tasks during the projects. Their project work was on top of their normal daily responsibilities, unlike in the software development Scrum teams, which are dedicated full time to Scrum projects. The software development Scrum teams generally have a dedicated project room to co-locate the team and house the Scrum board. Future research comparing the perceptions of part-time Scrum teams with full-time Scrum teams might illuminate different perceptions regarding the Scrum process.

5.5   Conclusions

The purpose of this research was to investigate the perceptions of practitioners, using the Scrum project framework, to evaluate the frequency, mode and tools of communication in successful projects, while identifying potential problems introducing Scrum to project management teams.

From the Phase 1 and Phase 2 results, the four identified themes of the Scrum process were (1) project clarity, (1) accountability (3) project momentum and (4) project communication tools of the daily stand-up meeting and the Scrum board. The results are summarised below in relation to each identified theme.

Project Clarity:
Project clarity was evident in both phases of the study, from Development Team members and the Product Owners. The Scrum process created clarity of project actions and clarity of project status. The results suggest project clarity removed the ambiguity of the project tasks and also participants roles associated with those tasks. The quantitative frequency results also suggested Scrum was more effective in creating project clarity than other project methodologies.

Accountability:
Perception of project accountability was apparent in both phase 1 and phase 2 of the

study. The results indicated the daily stand-up meeting and scrum board created project clarity which led to the accountability of the individual tasks and visibility of all team members' tasks further created accountability. Results also indicated the Scrum process was effective to create accountability and was more effective in creating accountability than other project methodologies the study participants had used.

However, the study identified the problem of perceived harassment associated with the high level of accountability created from the Scrum process. This transparency was in reference to the daily stand-up meeting and Scrum board. Feedback relating to harassment was not evident, nor disclosed, in other themes identified in the study analysed. This is an area of potential future research on communication styles and personality types who respond positively or negatively to levels of accountability in project teams.

Project Momentum:

Project momentum was evident in results of both Phase 1 and Phase 2 of the study. The Scrum process created visibility through communication updates which enhanced project momentum. The results indicated that the Scrum process reduced wastage of time that increased project efficacy and further enhanced momentum. Results also indicated the Scrum process was more effective in creating momentum than other project methodologies the study participants had used.

Communication Tools
Communication was enhanced through the Scrum process, with the use of communication tools such as the daily stand-up and the Scrum board. These tools had associated relationship with the themes of project clarity, accountability and momentum.

It can be surmised from the strong endorsement of the daily stand-up meeting, evidenced in the study finding, that this communication tool was strongly effective in enhancing project communication. This is in contrast to the Scrum board which had mixed qualitative results indicating project clarity and accountability yet elements of harassment and scored poorly in the quantitative data, which did not show statistical significance in the correlation data to project clarity momentum, or

accountability. This result suggests more research is required to understand the individual strengths and weaknesses of the Scrum board.

6   CHAPTER SIX: Conclusion

This chapter discusses the study results followed by a description of the benefit of the study in relation to the triple dividend, of (1) contribution to self (2) contribution to organisation and (3) contribution to theory. Further discussion highlights potential areas of future research followed by a final conclusion.

6.1   Study Question

The study recognised that multiple perspectives are necessary to understand the nature of the Scrum project framework efficacy. The study did not attempt to definitively conclude on Scrum's efficacy, rather the extent to which stakeholder perception within an organisation indicated its relevance and continued use in addition to contributing to empirical evidence of the Scrum framework as an effective tool in the non-ICT projects. A constructivist paradigm was deemed most appropriate in achieving the purpose of the study and answering the research questions. The study was mostly qualitative in nature . However, the results were complemented with quantitative data to gain added insights.

The study identified four themes: (1) Clarity (2) Accountability (3) Momentum and (4) Communication Tools of the daily stand-up and the Scrum board. The study results indicated that the Scrum framework created project clarity for the project team members. The project clarity created individual accountability to complete self-assigned tasks to move the project forward, and that individual accountability resulted in project momentum. The results of the study also indicated the communication tools of the daily stand-up and the Scrum board promoted clarity, accountability and momentum.

A clear problem identified from this study which introduced Scrum into project teams. The problem identified related to project accountability creating a feeling of harassment in relation to frequent assessment of transparency during the Scrum process. The overall perception of the Scrum board scored least of all the questions in this study and may be related to transparency and accountability associated with the perception of harassment identified.

The element underpinning project communication was the daily stand-up communication tool, with 100% frequency score, and the related daily meeting

frequency that enhanced project clarity, accountability and project momentum. The daily stand-up meeting was perceived as the ideal tool to enhance communication in the Scrum project framework and represented the narrative interpersonal mode of communication, typified by meaningful two-way communication.

In summary, the study results demonstrated the Scrum framework was an effective project management methodology in the non-ICT projects. The survey results demonstrated Scrum was a more effective methodology to enhance communication and clarity in the project teams than other project methodologies. Communication was enhanced due to regular and increased number of meetings throughout the project. The daily frequency of verbal communication using the daily stand-up meetings, created clarity of the project status and the project tasks, leading to enhanced accountability and project momentum. .

The daily update of the visualization communication tool, the Scrum board appeared as an important coordination tool when used in conjunction with the daily stand-up, however, more research is needed to isolate the most effective use of the scrum board in non-ICT projects.

6.2   Contribution

The Professional studies approach identifies three categories of contributions known as the Triple Dividend. The researcher focused on the triple dividend and undertook a practice-based action (active) learning through work-based research. Through the triple dividend, the researcher made three measurable and evidenced contributions through this study. First, contribution to the individual, both personal and professional. Second, contribution to the organizational knowledge to improve professional practice. Third, the contribution to academic knowledge in the area of professional practice (Lann, 2012).

6.2.1   Contribution to Self

My experience over the past seventeen years, working for large international medical technology sales organisations, has unfolded the increasing complexity of matrixed siloed organisations that has resulted in complex layers of communication and protracted decision making. In contrast, department heads from small and medium-sized enterprises have reported fewer collaboration problems and higher

team performance satisfaction, compared to department heads in large enterprises (Steinheider & Al-Hawamdeh, 2004). Within the large multinational organisations, personnel in each silo has unique measurement incentives which shape behaviours to benefit that individual rather than the company as a whole (Briody & Erickson, 2014). My experience as an account manager, meeting with executive customers shows the customers desire to interact with a single individual who represents the entire company, in a timely manner. Combining this expereicne as an account manager with a methodology such as Scrum to create cross-functional teams may provide timely coordinated responses for the customers.

To become familiar with the Agile methodology of Scrum, the researcher completed a Scrum Master certification, through Axis Agile. The researcher then undertook and completed a number of scrum projects within the sales organisation to test the applicability of the Scrum framework. The results of these initial Scrum projects were anecdotally positive, hence, the opportunity to empirically test the Scrum framework. There are limited examples of Scrum research in the non-IT context (Dingsøyr et al., 2012; Gustavsson, 2016). The potential benefit of this research project was adding to the knowledge of workplace project management in relation to using the Scrum framework, outside the IT software development context.

There are three distinct opportunities the research outcomes present to the researcher on a personal development level. Firstly, on completion of this Master of Professional Research Program, the researcher can demonstrate empirical results confirming the effectiveness of Scrum as a project management framework. More specifically, the results demonstrate the effectiveness of Scrum across small cross-functional teams within the sales organisation for non-IT projects. The results allow the researcher to promote the expansion of the implementation of Scrum as a project management framework wider across this organisations Australia and New Zealand business. Furthermore, explore potential opportunities to expand the Scrum process and further research into this organisations Asia Pacific business. The presentation and promotion of these results to the executive leadership team of the organisation offers the researcher a higher organisational profile and a potentially expanded role in project management facilitations.

Secondly, the researcher has previously presented at the Strategic Accounts Management Association (SAMA) industry conference in Chicago in May 2016, on Scrum theory and the initial Scrum pilot projects. The researcher also framed the opportunity Scrum brings to strategic account managers to coordinate their company products and services to customer's needs. The researcher presented updated Scrum research plans and learnings at the SAMA annual conference in Washington DC, May 2017. The study results now afford the researcher an opportunity to return to SAMA with empirical data to confirm the anecdotal findings previously presented. The SAMA forum is an internationally recognised industry body leading the way in customer and company value interactions. Hence, the research outcomes afford the researcher an international platform of recognition.

Thirdly, the research could lead the researcher to further research in the area of Scrum in non-IT context at the PhD level, with opportunities to further develop the Scrum project management framework for business and sales organisations.

The researcher has surpassed his learning objectives in undertaking an initial review of project management modalities to create efficiency within his organisation. He is now recognised within areas of the organisation as someone to call upon to facilitate projects using Scrum and is consulted about Scrum regularly within the organisation. Furthermore, all his work practices are now Scrum based, using a Scrum board to prioritise and track all work tasks, while using the short structured daily stand-up model to conduct internal meetings.

6.2.2   Contribution to Organisation

As indicated above researcher is in a position to present the research findings and to promote the effectiveness of Scrum as a cross-functional project management framework within the medical technology organisation, both within ANZ teams and further into the Asian branch of the organisation. The benefit to the medical technology organisation is to create small cross-functional teams on a regular and expanding base to create effective and efficient project outcomes. The researcher is also in a position to mentor Scrum Masters within the organisation to create more Scrum project facilitators to expand Scrum within the organisation more rapidly. Ideally mentored Scrum Masters would be from each silo/functional group, so a

champion can lead projects within silos as well as have the benefit of facilitating cross-silo (cross-functional) teams.

The significance of this research is the potential for Scrum project team members to have a higher sense of effectiveness and efficiency, ultimately increased productivity for the organisation. There is also a potential significance of the collaborative framework Scrum promotes, which could be wide-ranging for the organisation. As evident from the research results, it can improve collaboration within the organisation and between functions and silos, as it facilitates work with other groups to get the job done. It improves the effectiveness of teams to bring products, services and solutions to market. It enables organisational teams to engage effectively and timely with customers, to ultimately improve the perception, "We are easy to do business with."

6.2.3 Contribution to Theory

From a professional perspective, this study will also allow the researcher to comment on the effectiveness of Scrum framework as a project management tool to the peer group of Strategic Account Managers, through the Strategic Account Management Association.

This research adds to the empirical body which identifies the benefits of Scrum as a project management framework outside of the software development (IT) domain. The results add to the body of evidence confirming the beneficial contributing factor of communication within a project team. The research data also provides a rare reflection on the specific regularity and structure of project team communication which has been missing from much of the literature to date. Furthermore, the results suggest the communication structure, utilising the Daily Stand-up and Scrum Board have a perceived positive effect on individual accountability.

6.3 Future Research

This research study has highlighted a number of areas of potential research that would benefit the ongoing body of evidence related to the Scrum framework in non-ITC organisations.

From the identified problem of perceived harassment, future research in the area of transparency/visibility with associated accountability related to the Scrum process would be important to assess the level of comfort of project participants in using Scrum. Is there a frequency of communication and transparency which detracts from accountability and leads to perception of harassment? Does the level of accountability detract or assist in individual motivation and project momentum? Is there a tipping point where momentum declines? Are there personality types who respond better or worse to high levels of transparency and accountability? Further research in this area may also be useful to investigate personality types and or job descriptions which may not respond well to high levels of accountability.

A further area of research identified is to investigate if the Scrum process framework would be perceived as an effective project methodology in more complex and larger projects.

A comparative study can be undertaken between "tailored" Scrum teams that are formed around a specific vision and projects teams who take on a Scrum framework process after they have been formed to test the "retrofitting" of Scrum to project teams. Can the Scrum project management process be introduced effectively into existing projects and project teams after they have already initiated their projects?

6.4   Conclusions

This study investigated the perceptions of practitioners, using the Scrum project framework, to evaluate the frequency, mode and tools of communication in successful projects in a non-ITC organisation, while also identifying potential problems associated with the introduction of Scrum.

The results demonstrated that Scrum is an effective project management methodology. It is a more effective methodology to enhance communication and clarity in the project team than other project methodologies. The daily frequency of communication enhances overall communication throughout the project.

The findings also reflect that Scrum methodology leads to enhanced project clarity through specific tasks in the sprint backlog and development of clear goals in

Scrum methodology, which creates a sense of responsibility and accountability among team members.

The results indicate accountability is related to project clarity. Project task clarity and regular transparent communication build an environment of accountability. The results suggest the themes of clarity, accountability, momentum and communication are not separate factors, but are interrelated, working together as parts of the Scrum framework.

The results identified the increased transparency/accountability led to a problem of perception of harassment by at least one study participant, whch is important to study further.

The study results suggest daily communication frequency is effective to maintain project communication, clarity, accountability and project momentum.

The study results suggest the narrative communication mode of the daily stand-up meeting is a more successful communication mode than the visualization mode of the Scrum board.

The study results suggest the daily stand-up meeting is the most effective tool in the Scrum framework to enhance communication. The daily stand-up is related to enhancing communication, enhancing momentum, and improving accountability.

In summary, the results indicate the Scrum framework is perceived as a useful project management methodology for non-ITC projects that has the potential to increase the effectiveness of these projects through regular monitoring, enhancing transparency, accountability and motivation of the project team.

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8   Appendix

8.1   Vision Statement Template

Figure 13: Vision Statement Template

Source: Developed for this research, 2018.

8.2   Scrum Retrospectives

8.2.1   Scrum Retrospective #1

PRODUCT OWNER:

- Fast way to achieve high-value outcomes
- The process created clear accountability
- Daily standup was excellent for continuous communication
- Output was great. Actually had an output!
- A lot of market insights gained.
- Uncovered pivot to a new direction not thought of previously
- Short time frame from start to finish of project was refreshing.
- Has set aside a budget for Scrum training of team members
- Agreed Scrum board in office for future projects would be positive

DEV #1:

- Vision a bit ambiguous / needs to be clearer / need to refer to vision regularly
- Liked the process, unsure if the output was valuable due to ambiguous vision
- No wasted effort knew what to do at all times.

DEV #2:

- Vision didn't inspire a clear goal.
- The continued pace was refreshing
- Daily meetings good to keep the momentum.
- Review to stakeholders needs to involve Product Owner (PO was overseas at the time of retrospective), as PO vision lost in the presentation by the team.

DEV #3:

- No wasting time during project, efficient process.
- Scrum board more central location would be better.
- Good continuous communication throughout the project.
- Questioned their own value contribution, but positive about the Scrum process.

DEV #4:

- Was quick, targeted and focused use of team time
- No doubling up of work flows during the project.
- Want to use process in own BU

LEARNINGS FROM SCRUM #1

1. Vision statement ambiguous, didn't inspire a clear goal. Spend more time with PO on vision.
2. More time in Scrum kick-off meeting on vision with the team.
3. Communicate vision in daily stand-up.
4. Locate Scrum board in more central location.

5. PO needs to be in review process with stakeholders / PO needs to be able to articulate vision

8.2.2 Scrum Retrospective #2

PRODUCT OWNER:

- The narrower vision created clarity for team
- Scrum process creates targeted focused results
- Scrum process creates momentum
- Scrum board pics out each day was a good update for the team

DEV #1:

- Liked Scrum process, no time wasting
- Liked knowing what everyone is doing, daily stand-up good for visibility

DEV #2:

- Scrum process is excellent, clear what I was doing.
- Also liked the clarity of whos doing what from Scrum board and daily stand-up.
- Clarity of project workflow of what and when and where the project is up to.

DEV #3:

- Process efficient for time as all have "day time jobs."
- Clearer vision kept team focused on tasks, what we were doing.
- Better Scrum board use, more accessible.
- Daily stand-up excellent, "keeps me up to date."

DEV #4:

- Personally time poor, but projects clear actions/items to be done meant no time wasting.
- Daily meetings excellent for project updates.
- Daily meeting and Scrum board updates meant always knew where the project was at.
- Clear who is doing what at all times.

LEARNINGS FROM SCRUM #2

1. Clearer vision discussed during Sprint planning meeting worked well, better team buy in to project goal.
2. Restating vision at each stand up kept project goal in focus.
3. More visible Scrum Board with daily email pic updates was helpful.

8.2.3   Scrum Retrospective #3

PRODUCT OWNER:

- Scrum improved actions of the group
- Scrum fast tracked activities
- Like to do Scrum again for next project.
- But would like more time with Scrum theory next time, just jumped in!

DEV #1:

- Agree. Like to understand more theory on the process. perhaps more time before jump in to go over the process.
- Scrum process focussed the group to action.
- Loved the open communication and transparency
- Stand-up meetings great after initial negative thoughts of a daily meeting, kept information flowing.
- Maybe use an electronic tool for Scrum board to capture actions?

DEV #2:

- Liked the Scrum concept, it was easy to kick off and go!
- Scrum was quick to get to results, was motivating.
- Clear communicatio, daily stand-up was excellent despite not wanting to do daily meetings.

DEV #3:

- Great model for projects. Clear accountability, cannot hide!
- Rapid results, felt like we achieved really quickly
- The actionable tasks and outcomes meant not wasting time.
- The process meant always up to date where the team and project was at.

DEV #4:

- Increased project and team communication was excellent from daily meeting and scrum board.
- Actions were known for each person, no ambiguity of tasks/roles.

LEARNINGS FROM SCRUM #3

- Spend more time with first meeting allowing the team to understand Scrum process in more depth .
- Maybe an electronic tool for capturing actions?

8.2.4   Scrum Retrospective #4

PRODUCT OWNER:

- Team knowing each other well worked with overall communication
- The co-located team worked well
- Standing around Scrum board for daily stand-ups worked well

DEV #1:

- Daily stand-ups were surprisingly short yet created continuous communication so process powerful to keep the team on track
- Standing around Scrum board in the morning highlighted daily stand-up making things clearer.
- I did not want to be seen to not achieving; process kept accountability real!

DEV #2:

- Agree with accountability, didn't want to be "the one" at daily stand-up who had not achieved anything.
- Seeing items move on Scrum board was positive reinforcement of project momentum
- The team committed to helping each other out as Scrum board, and daily standup created "team affect."

DEV #3:

- Daily stand-up calls worked surprisingly well, did not impose on day/time, kept everyone informed and accountable
- Scrum board created visibility during the day to remind what was to be done, stopped procrastination

DEV #4:

- Agree with above comments re communication and accountable due to standup and Scrum board.
- Scrum board also created a distraction (in a good way) as wanted to keep doing Scrum actions instead of other work
- Momentum was continuous; suddenly we had a lot achieved.

LEARNINGS FROM SCRUM #4

- Having daily stand-up meeting around the Scrum board reinforced the project visibility.
- Could add names in different colours to create more visual clarity.

8.2.5   Scrum Retrospective #5

PRODUCT OWNER:

- The team were so efficient; I've never been this ready so far out from an event. Usually last-minute rush.
- Stand-up meeting worked well, communication set tone for the day, everyone knew what to do next.

DEV #1:

- The daily stand-up meeting created transparency, knew what was happening.
- Early morning for stand-up helped plan day, clear priorities.

DEV #2:

- Stand-up at the start of the day created accountability for days actions.
- No thoughts like "is this going to work?" felt in control at all times, positive vibe.
- Enjoyed process, I could see all the moving pieces as they were happening.
- Want to use process in other projects, wish I had known this before now!

DEV #3:

- Always in control, no sense of urgency crept in
- Stand-up timing was good for clarity of project progress and what to do next.
- The process was dynamic, always updating and could see progress
- Kept interest in the project due to constant update on Scrum board and the daily stand-up
- Would like to see earlier feedback on potential constraints (what's out of scope)

DEV #4:

- Loved process, now scrumming house build and husband!
- Built accountability to all team members.
- Stand-up was great start to the day to know what to tackle next.
- Hadn't exhausted all potential tasks before starting – should we?

LEARNINGS FROM SCRUM #5

- Spend more time in first meeting checking all User Story tasks exhausted.
- Would like to see earlier feedback on potential constraints (out of scope), discuss "in scope" and "out of scope" more to get consensus.

8.3 Survey Qualitative Results

Question 4: How does using SCRUM create clarity?

- Breaking it down into achievable and action-oriented outcomes. Ensuring team commitment and accountability to deliver upon designated actions. Strong momentum ensures information and actions are fresh in mind.
- By setting up the Scrum team, e.g. there is no team leader etc. up front. By investing time up front to define the tasks involved Using a visual scrum board to track where the project is at Checking in daily, so all team members are accountable, and all know how each task is progressing
- Definition of purpose and timeframe
- Focusing on every detail that needs completing helps to understand exactly what needs to be completed, with the frequent check-ins ensuring there's no time to procrastinate!
- Forces the team to specifically outline what they wish to achieve in order to progress with the project.
- By chunking down the work required and getting specific on deliverables
- In the SCRUM I was involved in there was a lack of clarity for me. Mainly because the original project question was nebulous. The process provides clarity on roles, responsibilities and Timelines
- A clear process of defining goals. Clear responsibilities reinforced daily - agile but no creep of scope of roles and responsibilities.
- Time & action specific
- SCRUM structure, especially meeting cadence and accountability brings transparency to individual responsibilities and overall project clarity
- By breaking down tactics and determining responsibility from the outset. This helps avoid confusion and conflict.

Question 7: How does SCRUM enhance communication?

- The regularity of meetings, everyone can check in and ensure they understand what needs to be completed and by when.
- The stand-up meetings enhance communication. For example, if you have tasks in the barrier column, they will be discussed and resolved quickly so as

not to slow the project. The stand-up meetings also work well virtually which is great for communication with virtual teams

- Regular contact with leader focussed on the removal of 'barriers'. Elevates accountability to project tasks Regular check-ins and the 'scrum board.'

- Forced communication and accountability through the daily stand up meetings. Each member of the project team is given equal time to share exactly how they are progressing with the project.

- By restricting the time for communication, it forces streamlined and time-effective communication.

- The regular catch ups enhance familiarity with tasks and timelines.

- Daily check-in ensures communication loops are closed.

- Task specific with individual roles assigned.

- The nature of SCRUM methodology ensures that there is a high degree of regular (and to the point) communication around project objectives.

- By mandating daily communication and reporting, the level of contact regarding a project is enhanced.

Question 10: How does SCRUM enhance momentum?

- It makes you feel obligated to deliver on tasks at a much quicker pace then you would normally.

- The team's commitment to attend daily calls - everyone has a sense of teamwork, and there was a strong desire on my part not to let the team down by not attending.

- The scrum board keeps team members on track. The stand-up meetings are very powerful in terms of accountability.

- The short project timeframes, e.g. we can get this done in one to two weeks sets an expectation that we will more quickly.

- Awareness and dealing with any barriers as we go greatly enhanced momentum.

- Short daily catch ups are easy to commit to.

- Makes people accountable.

- The scrum lead helps to ensure everyone is supported and has regular check-ins to check if anyone needs help.

- Through daily check-ins, tasks must usually be achieved within a few days before they would become a 'red flag', and alternative actions may be undertaken.

- By having more consistent accountable deadlines, the project was likely to maintain momentum.

- It makes team members more accountable because of the daily reporting.

- Daily accountability.

- Time-bound actions.

- SCRUM meeting cadence with embedded accountability to other project team members ensures momentum is not lost.

- It requires regular check-ins. This adds a sense of urgency regarding tactics and an onus on executing.

Question 13: How does SCRUM create accountability?

- It's very transparent if you don't deliver on commitments.

- As mentioned above, I felt a strong obligation not to let the team down, and so I was highly motivated to complete all tasks on time and attend the daily calls.

- The stand-up meetings. The usual board with tasks, we placed initials against the ones we worked on. Asking yourself what you have done to move the project forward is very powerful.

- People need to do what they say they will do, and it is reinforced continuously. The leader removing barriers means there should be little stopping people from fulfilling their tasks.

- All actions are agreed.

- The board and the daily meetings ensured accountability remained with the item owner.

- The structure of the task distribution on the SCRUM board and the daily stand up meetings means that there is very high exposure and clarity regarding the tasks that each team member is accountable for.

- Regular progress updates.

- As discussed previously. Can also feel like harassment.

Team pressure to hold each other accountable.

- Assigned tasks.
- SCRUM creates accountability because each project team member is required to address how they have and will contribute to project objectives on a regular basis. The SCRUM framework taps into a basic human desire to contribute to a common goal.
- Tasks have owners, and owners are held to account. The speed of execution means tasks might be re-allocated. This creates accountability.

Question 16: How does SCRUM create project speed?

- Short term mini-deadlines for each task ensure the project is always moving at a fast pace.
- The regularity of calls/meetings and strong teamwork.
- By having all tasks on the board, you know exactly what needs to get done. The visual board motivates you to move all tasks to the right.
- High momentum through short daily catch-ups. The ability to suspend activity in line with the project timeline was also effective.
- The daily meetings helped ensure forward trajectory constantly.
- Speed occurs as a direct result of the increased momentum of the project.
- By having aligned goals, regular updates and tight focus.
- Agility can increase speed, but self-direction (especially when new to process) can lead to delays.
- Clear, specific actions assigned to team members.
- The daily rapid-fire meetings ensure momentum is maintained and progress is quick.
- The SCRUM project creates speed by having daily meetings. People are encouraged/pressured to execute ahead of team conversations. This can be positive and negative for the team members. Some tasks in a project aren't required so soon in the project management process - however, the process places pressure on the individual contributors.

Question 18: How does use of a SCRUM Board affect the project team?

- The idea of having a visual up for all to see reminds people of commitments made and also drives you as you want to see more moved to the completed column. It is quite fulfilling having the visual.
- Creates accountability, clarity, speed in a project
- Effective but some confusion re classification of tasks on the continuum.
- You need only look to the board to check in on the project, know who owns any given task.
- It provides a consistent means for each team member to see how the project is tracking without much room for confusion or miscommunication regarding where the project is headed.
- It allowed for easy/transparent updates and a point of focus.
- Might be more helpful for the coordination.
- Visibility, transparency.
- NA
- It distils project status and can simplify complex project multitasks.
- Visual aid

Question 20: What effect does the "Daily Stand-up" have on the project team?

- Holds you accountable. It's also great to bounce things off the time. The idea of it being quick with no small talk is a nice change!
- Again, it ensures momentum and accountability.
- Accountability! You don't want to be the one who has not pulled their weight.
- Accountability, speed and momentum. Everyone can spare 15 minutes to think about a project - it is often harder to dedicate hour/s.
- Motivates and makes people take action on agreed tasks.
- Helps to keep yourself and the team in check and forward moving.
- It keeps the project front of mind for all team members, and it imparts a feeling of commitment and teamwork through the project team through seeing all team members turning up and reporting daily.
- Remind and refocus the team on the required activities.

- As stated it helps communication and clarity and speed but can feel like harassment and assumes the most important priority in your day This is the key factor to communication and accountability.
- Issues identified quickly.
- The daily stand-up creates a sense of urgency on project deliverables. knowing that you are going to have to describe to your team what you did yesterday and what you will do now creates accountability and is a strong call to action.
- It involves all team members. Ordinarily, I would not have an opportunity to connect with all members of a team as my Manager would participate. As a contributor and responsible for execution I feel this is effective.

Question 21: Any other comments regarding SCRUM as a project methodology?

- Loved it - would like the opportunity to be involved in another SCRUM managed project again.
- The simplicity is a key factor to the success of Scrum in my opinion.
- I really like the idea of bringing in experts within the process to add value at appropriate times. It is a concept I have raised in other meetings also really enjoyed the methodology.
- SCRUM is a great project methodology for projects that you want to be completed quickly, efficiently and simply.
- I believe the SCRUM methodology would be less effective in projects that require more complexity and time because if held for a long period of time (i.e. 2 months or more) the daily stand-ups may become more draining that momentum building.
- Scoping projects correctly is vital to scrum methodology to be effective.
- No
- It should be more broadly utilised.
- I believe a digital SCRUM board would be an effective tool in supporting the stand-up meetings.

8.4   Survey Quantitative Results

Q2 SCRUM is effective as a methodology to create project clarity among the project team.

Answered: 13   Skipped: 0

	STRONGLY DISAGREE (1)	DISAGREE (2)	UNDECIDED (3)	AGREE (4)	STRONGLY AGREE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	15.38% 2	46.15% 6	38.46% 5	13	4.23

BASIC STATISTICS				
Minimum 3.00	Maximum 5.00	Median 4.00	Mean 4.23	Standard Deviation 0.70

Q3 SCRUM is more effective in enhancing project clarity than other project methodologies you have used.

Answered: 13   Skipped: 0

	STRONGLY DISAGREE (1)	DISAGREE (2)	UNDECIDED (3)	AGREE (4)	STRONGLY AGREE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	7.69% 1	7.69% 1	61.54% 8	23.08% 3	13	4.00

BASIC STATISTICS				
Minimum 2.00	Maximum 5.00	Median 4.00	Mean 4.00	Standard Deviation 0.78

Q5 SCRUM is more effective in enhancing project communication than other project methodologies you have used.

Answered: 13   Skipped: 0

- **Strongly Disagree**
- **Disagree**
- **Undecided**
- **Agree**
- **Strongly Agree**

	STRONGLY DISAGREE (1)	DISAGREE (2)	UNDECIDED (3)	AGREE (4)	STRONGLY AGREE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	7.69% 1	61.54% 8	30.77% 4	13	4.23

BASIC STATISTICS					
Minimum 3.00	Maximum 5.00	Median 4.00	Mean 4.23	Standard Deviation 0.58	

Q6 On a scale of 1-5 rank the effectiveness of a SCRUM as a methodology to enhance communication among the project team.

Answered: 13   Skipped: 0

- **1 Least Effective**
- **2**
- **3**
- **4**
- **5 Most Effective**

	1 LEAST EFFECTIVE (1)	2 (2)	3 (3)	4 (4)	5 MOST EFFECTIVE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	7.69% 1	53.85% 7	38.46% 5	13	4.31

BASIC STATISTICS					
Minimum 3.00	Maximum 5.00	Median 4.00	Mean 4.31	Standard Deviation 0.61	

Q8 SCRUM is more effective in enhancing project momentum than other project methodologies you have used.

Answered: 13   Skipped: 0

Legend: Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree

	STRONGLY DISAGREE (1)	DISAGREE (2)	UNDECIDED (3)	AGREE (4)	STRONGLY AGREE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	7.69% 1	53.85% 7	38.46% 5	13	4.31

BASIC STATISTICS

Minimum	Maximum	Median	Mean	Standard Deviation
3.00	5.00	4.00	4.31	0.61

Q9 On a scale of 1-5 rank the effectiveness of a SCRUM as a methodology to enhance momentum among the project team:.

Answered: 13   Skipped: 0

Legend: 1 Least Effective | 2 | 3 | 4 | 5 Most Effective
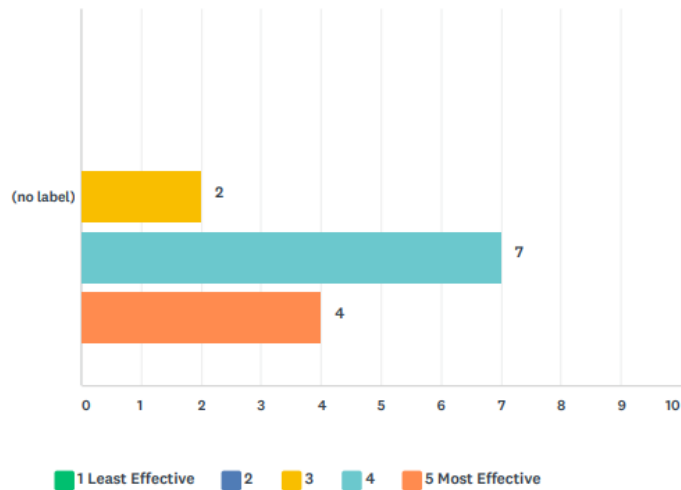
	1 LEAST EFFECTIVE (1)	2 (2)	3 (3)	4 (4)	5 MOST EFFECTIVE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	15.38% 2	53.85% 7	30.77% 4	13	4.15

BASIC STATISTICS

Minimum	Maximum	Median	Mean	Standard Deviation
3.00	5.00	4.00	4.15	0.66

139

Q11 On a scale of 1-5 rank the effectiveness of SCRUM as a methodology to create accountability among the project team?

Answered: 13   Skipped: 0

Legend: ■ 1 Least Effective   ■ 2   ■ 3   ■ 4   ■ 5 Most Effective

	1 LEAST EFFECTIVE (1)	2 (2)	3 (3)	4 (4)	5 MOST EFFECTIVE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	7.69% 1	38.46% 5	53.85% 7	13	4.46

BASIC STATISTICS

Minimum	Maximum	Median	Mean	Standard Deviation
3.00	5.00	5.00	4.46	0.63

Q12 SCRUM is more effective in enhancing accountability of team members than other project methodologies you have used.

Answered: 13   Skipped: 0

Legend: ■ Strongly Disagree   ■ Disagree   ■ Undecided   ■ Agree   ■ Strongly Agree

	STRONGLY DISAGREE (1)	DISAGREE (2)	UNDECIDED (3)	AGREE (4)	STRONGLY AGREE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	15.38% 2	30.77% 4	53.85% 7	13	4.38

BASIC STATISTICS

Minimum	Maximum	Median	Mean	Standard Deviation
3.00	5.00	5.00	4.38	0.74

Q14 On a scale of 1-5 rank the effectiveness of SCRUM as a methodology to create project speed?

Answered: 13   Skipped: 0

1 Least Effective   2   3   4   5 Most Effective

	1 LEAST EFFECTIVE (1)	2 (2)	3 (3)	4 (4)	5 MOST EFFECTIVE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	7.69% 1	53.85% 7	38.46% 5	13	4.31

BASIC STATISTICS

Minimum	Maximum	Median	Mean	Standard Deviation
3.00	5.00	4.00	4.31	0.61

Q15 SCRUM is more effective in enhancing project speed other project methodologies you have used.

Answered: 13   Skipped: 0

Strongly Disagree   Disagree   Undecided   Agree
Strongly Agree

	STRONGLY DISAGREE (1)	DISAGREE (2)	UNDECIDED (3)	AGREE (4)	STRONGLY AGREE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	7.69% 1	53.85% 7	38.46% 5	13	4.31

BASIC STATISTICS

Minimum	Maximum	Median	Mean	Standard Deviation
3.00	5.00	4.00	4.31	0.61

Q17 On a scale of 1-5 can you rank the effectiveness of using a SCRUM Board to enhance communication within a project team?

Answered: 12   Skipped: 1

1 Least Effective   2   3   4   5 Most Effective

	1 LEAST EFFECTIVE (1)	2 (2)	3 (3)	4 (4)	5 MOST EFFECTIVE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	8.33% 1	33.33% 4	33.33% 4	25.00% 3	12	3.75

BASIC STATISTICS

Minimum	Maximum	Median	Mean	Standard Deviation
2.00	5.00	4.00	3.75	0.92

Q19 The "Daily Standup" is effective in enhancing communication within a project team?

Answered: 13   Skipped: 0

Strongly Disagree   Disagree   Undecided   Agree
Strongly Agree

	STRONGLY DISAGREE (1)	DISAGREE (2)	UNDECIDED (3)	AGREE (4)	STRONGLY AGREE (5)	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	0.00% 0	0.00% 0	53.85% 7	46.15% 6	13	4.46

BASIC STATISTICS

Minimum	Maximum	Median	Mean	Standard Deviation
4.00	5.00	4.00	4.46	0.50

8.5 Table 12: Quantitative Survey Results

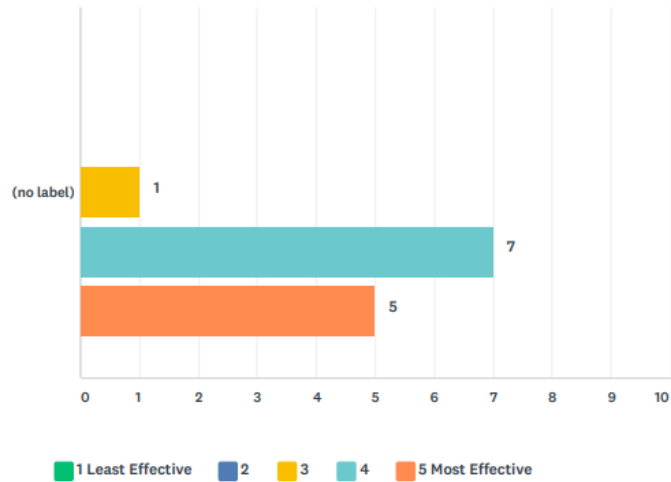| Measure		SCRUM is effective as a methodology to create project clarity among the project team	SCRUM is more effective in enhancing project clarity than other project methodologies you have used	SCRUM is more effective in enhancing project communication than other project methodologies you have used	Effectiveness of a SCRUM as a methodology to enhance communication among the project team	Better SCRUM is more effective in enhancing project momentum than other project methodologies you have used	Effectiveness of a SCRUM as a methodology to enhance momentum among the project team	Effectiveness of SCRUM as a methodology to create accountability among the project team	SCRUM is more effective in enhancing accountability of team members than other project methodologies you have used	Effectiveness of SCRUM as a methodology to create project speed	SCRUM is more effective in enhancing project speed other project methodologies you have used	The effectiveness of using a SCRUM Board to enhance communication within a project team	The "Daily Standup" is effective in enhancing communication within a project team
SCRUM is effective as a methodology to create project clarity among the project team	Pearson Correlation	1.000	.704**	.443	.196	.196	.090	.455	.426	.379	.379	.458	.136
	Sig. (2-tailed)		.007	.130	.520	.520	.770	.118	.147	.202	.202	.116	.657
	N	13	13	13	13	13	13	13	13	13	13	13	13
SCRUM is more effective in enhancing project clarity than other project methodologies you have used	Pearson Correlation	.704**	1.000	.170	.162	.486	.148	.309	.399	.486	.486	.551	.393
	Sig. (2-tailed)	.007		.578	.597	.092	.629	.304	.177	.092	.092	.051	.184
	N	13	13	13	13	13	13	13	13	13	13	13	13
SCRUM is more effective in enhancing project communication than other project methodologies you have used	Pearson Correlation	.443	.170	1.000	.679*	.238	.109	.340	.515	-.204	-.204	.404	.433
	Sig. (2-tailed)	.130	.578		.011	.434	.724	.255	.071	.505	.505	.171	.139
	N	13	13	13	13	13	13	13	13	13	13	13	13
Effectiveness of a SCRUM as a methodology to enhance communication among the project team	Pearson Correlation	.196	.162	.679*	1.000	.581*	.650*	.631*	.768**	.161	.161	.417	.803**
	Sig. (2-tailed)	.520	.597	.011		.037	.016	.021	.002	.599	.599	.156	.001
	N	13	13	13	13	13	13	13	13	13	13	13	13
SCRUM is more effective in enhancing project momentum than other project methodologies you have used	Pearson Correlation	.196	.486	.238	.581*	1.000	.650*	.231	.596*	.581*	.581*	.274	.803**
	Sig. (2-tailed)	.520	.092	.434	.037		.016	.448	.032	.037	.037	.364	.001
	N	13	13	13	13	13	13	13	13	13	13	13	13
Effectiveness of a SCRUM as a methodology to enhance momentum among the project team	Pearson Correlation	.090	.148	.109	.650*	.650*	1.000	.014	.194	.458	.458	.321	.717**
	Sig. (2-tailed)	.770	.629	.724	.016	.016		.964	.526	.116	.116	.284	.006
	N	13	13	13	13	13	13	13	13	13	13	13	13
Effectiveness of SCRUM as a methodology to create accountability among the project team	Pearson Correlation	.455	.309	.340	.631*	.231	.014	1.000	.771**	.231	.231	.325	.299
	Sig. (2-tailed)	.118	.304	.255	.021	.448	.964		.002	.448	.448	.279	.320
	N	13	13	13	13	13	13	13	13	13	13	13	13
SCRUM is more effective in enhancing accountability of team members than other project methodologies you have used	Pearson Correlation	.426	.399	.515	.768**	.596*	.194	.771**	1.000	.252	.252	.252	.563*
	Sig. (2-tailed)	.147	.177	.071	.002	.032	.526	.002		.407	.407	.406	.045
	N	13	13	13	13	13	13	13	13	13	13	13	13
Effectiveness of SCRUM as a methodology to create project speed	Pearson Correlation	.379	.486	-.204	.161	.581*	.458	.231	.252	1.000	1.000**	-.011	.294
	Sig. (2-tailed)	.202	.092	.505	.599	.037	.116	.448	.407		0.000	.972	.330
	N	13	13	13	13	13	13	13	13	13	13	13	13
SCRUM is more effective in enhancing project speed other project methodologies you have used	Pearson Correlation	.379	.486	-.204	.161	.581*	.458	.231	.252	1.000**	1.000	-.011	.294
	Sig. (2-tailed)	.202	.092	.505	.599	.037	.116	.448	.407	0.000		.972	.330
	N	13	13	13	13	13	13	13	13	13	13	13	13
effectiveness of using a SCRUM Board to enhance communication within a project team	Pearson Correlation	.458	.551	.404	.417	.274	.321	.325	.252	-.011	-.011	1.000	.587*
	Sig. (2-tailed)	.116	.051	.171	.156	.364	.284	.279	.406	.972	.972		.035
	N	13	13	13	13	13	13	13	13	13	13	13	13
The "Daily Standup" is effective in enhancing communication within a project team	Pearson Correlation	.136	.393	.433	.803**	.803**	.717**	.299	.563*	.294	.294	.587*	1
	Sig. (2-tailed)	.657	.184	.139	.001	.001	.006	.320	.045	.330	.330	.035	
	N	13	13	13	13	13	13	13	13	13	13	13	13

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

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8.6 Human Research Ethics Approval

OFFICE OF RESEARCH
Human Research Ethics Committee
PHONE +61 7 4687 5703| FAX +61 7 4631 5555
EMAIL human.ethics@usq.edu.au

UNIVERSITY
OF SOUTHERN
QUEENSLAND

14 September 2017

Mr Ross Forbes

Dear Ross

The USQ Human Research Ethics Committee has recently reviewed your responses to the conditions placed upon the ethical approval for the project outlined below. Your proposal is now deemed to meet the requirements of the *National Statement on Ethical Conduct in Human Research (2007)* and full ethical approval has been granted.

Approval No.	**H17REA189**
Project Title	How does scrum affect individuals perception within small cross-functional teams about how effective and efficient the project team is?
Approval date	14 September 2017
Expiry date	14 September 2020
HREC Decision	**Approved**

The standard conditions of this approval are:

(a) Conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal required by the HREC
(b) Advise (email: human.ethics@usq.edu.au) immediately of any complaints or other issues in relation to the project which may warrant review of the ethical approval of the project
(c) Make submission for approval of amendments to the approved project before implementing such changes
(d) Provide a 'progress report' for every year of approval
(e) Provide a 'final report' when the project is complete
(f) Advise in writing if the project has been discontinued, using a 'final report'

For (c) to (f) forms are available on the USQ ethics website:
http://www.usq.edu.au/research/support-development/research-services/research-integrity-ethics/human/forms

Samantha Davis
Ethics Officer