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Linking complexity factors and project management approaches to performance: an embedded single case study of IT-enabled change projects in Australia

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Abstract

Purpose – The purpose of this paper is to provide a holistic view of the link between the identification of complexity contributing factors, the application of project management approaches and their impacts on the performance of Information Technology (IT)-enabled change projects.

Design/methodology/approach – A qualitative approach of an embedded single-case design comprising three IT-enabled change projects delivered in Australia was used to explore the impact of complexity contributing factors and project management approaches on project performance measures. Semi-structured interviews were used as the main data collection method. Thematic analysis was used as the data analysis approach.

Findings – The results from the thematic analysis highlight that complexity contributing factors are related to two categories of complexity defined in this paper: technical uncertainties and uncertainty in goals and deliverables, both have an impact on the performance of IT-enabled change projects. It also highlights key project management approaches such as the use of an adaptive management approach and good communication as key to managing complexity. It also identifies a misalignment between stakeholder perception of success and the project management success measure for complex IT-enabled projects.

Research limitations/implications – The research is based on data collected from Australian participants involved in three case studies. Additional data collection and reviews from practitioners in the field of project management could further refine and improve this research.

Practical implications – The research facilitates the identification of specific complexity contributing factors at the early stage of a project to ensure that the appropriate project management approaches and success measures are used.

Originality/value – The paper contributes to rethinking the pathways towards improving project performance in the IT sector by expanding the identification of project complexity to understanding how complexity and the management approaches impact project performance.

Keywords Project complexity, Success, Information technology, Project management, Communication, Agile, Transformation, Organisational change

Paper type Research paper

1. Introduction

Organisations implement Information Technology (IT)-enabled change projects to remain competitive in their marketplace (Jugdev and Thomas, 2002). The implementation of IT-enabled change projects has increased efficiency and improved access to government services (Weerakkody *et al.*, 2011; Ziemba *et al.*, 2013). This leads to the question, what are IT-enabled change projects? These are a type of IT project that delivers IT systems that support

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business and service transformation. These projects heavily rely on the IT systems to support implementing the business change associated with business and service transformation (Brouwer, 2011; Chief Information Office, 2018; Iveroth, 2010).

Although there are numerous advantages related to the implementation of IT-enabled change projects, these projects continue to remain complex. They are generally challenged by sociocultural issues and organisational processes (Hughes *et al.*, 2017; Taipalus *et al.*, 2020; Teoh, 2010; Weerakkody *et al.*, 2011; Janssen *et al.*, 2011; Jorgensen, 2018, 2019). These challenges faced can be viewed as factors that contribute to their complexity (Baccarin, 1996; Murray, 2000; William, 1999; Turner and Cochrane, 1993). Previous research has found complexity in IT-enabled change projects due to factors such as scope creep, the number of stakeholders involved, new technology, lack of understanding of business issues and resistance to change (Janssen *et al.*, 2015; Murray, 2000; Weerakkody *et al.*, 2011; Klaus *et al.*, 2015).

An understanding of complexity provides knowledge of the real-world challenges that projects face as the presence of complexity makes a project unpredictable and dynamic (Hass, 2009). According to Baccarin (1996), the presence of complexity reduces the chances of successfully delivering a project on time and within budget. Due to the fact that complexity can have a positive or negative influence on projects, simply not knowing or actively ignoring the presence of complexity prevents project managers from seizing the opportunities and avoiding the negative phenomenon that can occur. Kiridena and Sense (2016) highlighted the ambiguity around relating complexity to project management practice. Gaining an understanding of how project complexity relates to project management practice will ensure that appropriate management strategies, effective decision-making and risk management approaches are applied to complex projects. IT-enabled change projects are often criticised because of high failure rates that can be attributed to the presence of complexity within these projects (Hastie and Wojewoda, 2015). In previous years, success or failure of IT-enabled change projects has mostly been determined by traditional project management performance that focusses on the success of cost, time and specification (De Bakker *et al.*, 2010; Aranyossy *et al.*, 2018). Although the Project Management Institute (PMI), Project Management Body of Knowledge (PMBOK) and other researchers now include a broader view of success, these do not all tailor the measurement of success to the identified complexity contributing factor. The size was traditionally viewed as the key contributor to complexity, and it is commonly referred to when linking complexity to project performance (San *et al.*, 2018). With regard to IT-enabled change projects, the Standish report captures data on the percentage of projects that were successful based on the size of the project. The report shows that size impacts project performance. This means that size is a project complexity contributing factor that impacts project performance, but the report does not capture data on other complexity contributing factors (Hastie and Wojewoda, 2015; Jorgensen, 2018). The Standish report also uses categories to classify IT-enabled change projects into three types: Successful, Challenged and Failed. Previously, the report categorised successful projects as completed within budget and on time with original functions and features (Eveleens and Verhoef, 2010). Challenged projects were completed with fewer features and functions along with over the time estimates and over budget. Failed projects were simply cancelled before completion (Eveleens and Verhoef, 2010; Parliamentary Office of Science and Technology, 2003). Although the 2015 Standish report added additional elements like value and customer satisfaction to success measures and it identified that smaller projects are more likely to be successful than larger and more complex projects which have a higher risk of failure. The report does not fully describe what other the contributing complexity factors are and how they impact the performance of these projects (Hastie and Wojewoda, 2015). This is particularly an issue because project managers use the term complex in a variety of situations (Whitty and Maylor, 2009). In addition to this, the report also does not describe how well the traditional project management success aligns with stakeholder perception of success when the project is complex (Hastie and Wojewoda, 2015). Lech (2013) suggested that some stakeholders perceive some IT-enabled change projects to be successful despite not meeting the traditional project management success measures.

Previous research has addressed (1) why IT-enabled change projects fail (Kogekar, 2013; Parliamentary Office of Science and Technology, 2003; Whitney and Daniels, 2013) and (2) how project success can be measured (Cooke-Davies, 2002; Lech, 2013; Serrador and Turner, 2015). However, in addition to these, there are unexplored aspects that relate to facilitating the development of an integrated vision that provides a link between project complexity, project management approaches and their impact on the performance of IT-enabled change projects. There is also a need for research to move on from identifying and characterising complexity to responding to complexity by implementing appropriate management approaches and success measures for complex IT-enabled projects (Geraldi, 2011). As there are gaps in responding to complexity, this research explains how complexity impacts the performance of IT-enabled change projects and it explains how stakeholders perceive the success of these projects. It also highlights management approaches that assist with responding to complexity. An investigation of this issue will support improving the management of IT-enabled change projects or the selection of project managers that are competent in managing complexity within IT-enabled change projects. Improving the management of IT-enabled change projects includes supporting effective decisions, determining training required for complex projects or assisting project managers in deploying appropriate resources (Kiridena and Sense, 2016). The study by Antoniadis *et al.* (2011) identified that project complexity impacts project performance by causing delays in the construction industry. According to Whitty and Maylor (2009) and Bosch Rekveldt *et al.* (2011), an understanding of project complexity may not lead to predicting and controlling all aspects of project complexity as this may not be possible, but it should help with the management of project complexity. For instance, the accuracy of weather forecasting increases as the forecast range decreases. In relation to IT-enabled change projects, it may not be possible to predict the detail of every issue that will occur due to the presence of complexity within a project, but an understanding of project complexity may cause projects to adapt and remain flexible by applying the rolling wave planning or other agile project management methodologies.

Furthermore, although the existing literature has focussed primarily on how IT-enabled change projects have performed in relation to the project management success measures, very limited research has been undertaken to investigate the relevance of the iron triangle project performance measure when compared to how stakeholders perceive the success of complex IT-enabled change projects. Therefore, this research investigates the impact of project complexity on the performance of IT-enabled change projects when success is based on the iron triangle in determining success or failure and stakeholder perception of success of complex IT-enabled change projects. There is a need to address the management perception of success to ensure that appropriate management approaches are put in place to improve the success of IT-enabled change projects.

The research questions addressed are:

RQ1. How does complexity impact the performance of IT-enabled change projects based on the iron triangle?

The characteristics IT-enabled change projects such as the size of the project, new technology and ambiguity in the definition of objectives can influence the performance of these projects (Alami, 2016; Geraldi *et al.*, 2011; Hastie and Wojewoda, 2015; Whitney and Daniels, 2013). The identification of project complexity and its influence on the performance of IT-enabled change projects needs to be integrated into understanding how specific aspects of complexity impacts on cost, time and specification along with determining the adequacy of the project management approaches to managing and measuring success.

RQ2. How do stakeholders perceive success in complex IT-enabled change projects and which management approaches are used to respond to complexity?

These projects face organisational, social-cultural and technology challenges that could be associated with the level of complexity. There is currently no widely accepted integrated vision of how complexity impacts IT-enabled project success measures that include the application of management approaches. An understanding of project complexity will help facilitate the development of appropriate success measures and management approaches as part of an integrated vision. Delivering these projects will help prepare an organisation for the future as the organisation is restructured yet it is unclear whether stakeholder's perception of success aligns with meeting the project management success measures (Iveroth, 2010). This paper will address this issue by comparing stakeholder perception of success to elements of project management success measures.

This paper presents the results from three case studies. It presents the impacts of project complexity on the performance of IT-enabled change projects. It also presents stakeholders perception of success in complex IT-enabled change projects.

2. Literature review

This research is primarily focussed on measuring project performance and understanding complexity. Project management researchers have been reviewing the use of management approaches towards managing complex projects but indicators of the success of these management approaches cannot be determined without appropriate success measures (Dao *et al.*, 2017; Kiridena and Sense, 2016). In addition to this Wateridge (1998) highlighted that a manager's career will depend on what they are judged on. To ensure that appropriate management approaches are implemented there needs to be an appropriate measure for project performance. The literature review on project performance measurement shows that multiple researchers have highlighted the need for additional approaches towards measuring project success that are not limited to cost, time and specification. In addition to this, the literature review on project complexity and the complexity of IT-enabled change projects shows that various researchers use different frameworks to categorise complexity that occurs within projects. The literature review leads to the introduction of a project complexity framework for IT-enabled change projects that includes complexity categories and project complexity contributing factors that are based on literature. It also shows that researchers have identified that the management approach for these projects is changing due to the realisation that complexity and uncertainties exist within these projects. The different streams of research on project success and project complexity would benefit the project management community more if they are brought together to ensure that appropriate success measures and management approaches are in place for IT-enabled projects with the identified and characterised complexity.

2.1 Project performance measurement

According to De Bakker *et al.* (2010), project success criteria have been defined differently in the field of project management. The traditional model involves delivering within cost, time and specification. This is referred to as project efficiency. Not only did the measurement for project success focus on these, it was also believed that the reward system for project managers focussed on delivering to time and cost. The broader view of project success can be seen as the stakeholder's assessment of the project's characteristics which may include other characteristics as well as cost, time and specification (Serrador and Turner, 2015). The traditional view of success is still referred to along with other success measures (Taipalus *et al.*, 2020; Hassan and Asghar, 2021). The 2017 PMP report suggested that due to the competitive nature of today's world, the traditional success measure of scope, time and cost are no longer suitable, but it goes on to recognise successful organisations as champions if 80% of projects are delivered on time, within budget and if they meet their objectives. It also adds the need for high benefits realisation maturity. Some elements of project efficiency measures are continuously used along with other success measures (PMI, 2017).

The project efficiency measure of success is often criticised because it limits project managers to considering only short-term successes rather than a holistic view of success or the longer-term successes that are more aligned to the original reasons for initiating projects. The project efficiency measure also does not provide a view of how the project impacts the organisation or the success of the investment (Turner and Zolin, 2012; Serrandor and Turner, 2015). This leads to a different perspective of the way projects are viewed. According to Shenhar (1997), projects should be viewed as what they were initially initiated to do, which is "to make profit, create a new market, or gain additional capability." Some organisations simply view a project ending when it is delivered to a customer without considering the wider criteria that would affect the project when it is in use. Atkinson (1999) viewed project efficiency as a temporary measurement because it is only relevant at the delivery stage of the project and suggested that the inclusion of other criteria for project success such as stakeholders' satisfaction will help to provide more reliable information on project success. According to Serrandor and Turner (2015), recent measures of project success now includes a broader view. For example, the most recent version of PMI PMBOK now includes success measures like customer satisfaction.

However, the success of a project and the success of the project management effort are different. Project success results in meeting the objectives of the project and project management success involve delivering to time, cost and specification. The project management effort does not always lead to the success of a project (Cooke-Davies, 2002; De Wit, 1988). Serrador and Turner (2015) suggested that project management success should not be ignored as there is a correlation between project management success and project success. Furthermore, a stakeholder's perception of success or failure is dependent on time because what is important to a stakeholder depends on the project phase. Avots I (cited in De Wit, 1988) states that "during the early phase of the project, schedule is of primary importance, while cost takes second place and quality third. Later in the project, cost becomes the controlling interest, with schedule taking a secondary role. After the project has been completed, schedule and cost problems are forgotten, and quality becomes the key." Wateridge (1998) and Khan *et al.* (2013) concluded that both the project success and project management success dimensions along with other success criteria such as the impact on the project team, impact on customer, business success, preparing for the future, project profile and stakeholder satisfaction are important when assessing the success criteria of projects. With divergent views on the meaning of success, the key to identifying which success measure is appropriate is to define the success criteria for the IT-enabled change project at the start of the project by taking into account the context of the project (Taylor, 2004).

2.2 Project complexity

An understanding of project complexity does not mean that project complexity will be reduced but it will assist in the management of the project and selection of appropriate project personnel (Aitken and Crawford, 2007). This is supported by Snowden and Boone (2007) description of the challenges that leaders face. These challenges can be viewed as either, simple, complicated, complex or chaos. The attitude of leaders in these situations in terms of how they handle the situation should vary as different management approaches are required.

This overview helps differentiate simple, complicated, complex and chaos. In relation to project management, simple projects belong in the domain characterised by stability and clear cause–effect relationship exists. As all parties have a shared understanding as "known knowns" decisions are made. Applying best practice solutions is appropriate. Complicated projects belong to the domain known as "known unknowns." In this case, knowledge and expertise are required. Large construction projects are complicated. Complex projects are emergent, and they consist of ambiguity, uncertainty and interdependency. This domain is "unknown unknowns." Chaotic projects are "unknowables" (Bakhshi, 2016). Early research on project complexity provided individual descriptions of the different types of project complexities that exist within projects with a very limited holistic view of multiple types of project complexities. Baccarin (1996) introduced the concept of structural complexity. Turner and Cochrane (1993) introduced the concept of uncertainty complexity with their goals and methods complexity matrix. But recent research has provided more of a comprehensive overview within frameworks that describe how different types of complexities can exist within projects (Bosch Rekveldt *et al.*, 2011; Geraldi and Adlbrecht, 2007; Geraldi *et al.*, 2011; Murray, 2000; Remington *et al.*, 2007; Williams, 1999; Whitney and Daniel, 2013; Xia and Lee, 2005). Williams (1999) combined structural complexity by Baccarin (1996) with the goals and methods complexity matrix by Turner and Cochrane (1993) to create a single framework. Remington *et al.* (2007) and Geraldi *et al.* (2011) described how different types of complexities exist within projects by referring to early research. For large engineering projects, Bosch-Rekveldt *et al.* (2011) used the Technical, Organisational and Environment (TOE) framework to capture how different contributing factors of complexity fit into several categories in the TOE framework.

Project complexity is multifaceted as there are different components that make up project complexity. With multiple frameworks available for identifying complexity, multiple types of complexities can be classified and reclassified based on their contributing factor. For IT-enabled change projects, it is key that a complexity framework includes aspects that relate to both the IT system and the organisational change being introduced. After reviewing multiple complexity frameworks from the perspective of IT-enabled change projects, it has been identified that complexity contributing factors fit into four categories within the existing frameworks. This is based on the need for two aspects of uncertainty which are methods and goals. These are separate elements from structural complexity as identified by William (1999). This separation was retained by Remington *et al.* (2007). The TOE framework combines these two aspects of uncertainty complexity into technological complexity. For IT-enabled change projects, it is more useful to have a separate element that deals with the technical uncertainties and uncertainties that relates to goals and deliverables. The environmental aspect of complexity was not included in William (1999) complexity model, but it has been identified by several researchers (Bosch Rekveldt *et al.*, 2011; Remington *et al.*, 2007; Xia and Lee, 2005). The categories and contributing factors for IT-enabled projects are as follows:

(1) Technical uncertainties – this aspect of complexity relates to uncertainty due to a lack of knowledge when it comes to methods of implementation as first highlighted by Turner and Cochrane (1993). The design and technical characteristics are unknown or untried (Taipalus *et al.*, 2020). The contributing factors include experience with technology or new technology, technical dependencies and trust in the project team (Bosch Rekveldt *et al.*, 2011; Geraldi and Adlbrecht, 2007; Remington *et al.*, 2007; Turner and Cochrane, 1993; Williams, 1999; Xia and Lee, 2005)

(2) Uncertainties related to goals and deliverables – this aspect of complexity relates to uncertainty due to a lack of clearly defined goals and deliverables (Turner and

Cochrane, 1993). The contributing factors include deliverable changes, uncertainty in goals, planning issues due to on-going scope changes and conflicting interests (Bosch Rekveldt *et al.*, 2011; Williams, 1999; Whitney and Daniels, 2013; Geraldi and Adlbrecht, 2007; Geraldi *et al.*, 2011; Remington *et al.*, 2007; Xia and Lee, 2005).

(3) Organisational aspects – this element relates to the structure of the project which includes a variety of project elements and interdependence (Baccarini, 1996). The contributing facts include interdependence, project size and variety, skills availability, environment constraint and urgency and criticality of time (Baccarini, 1996; Geraldi *et al.*, 2011; Remington *et al.*, 2007; Xia and Lee, 2005).

(4) Environmental aspects: the element relates to changes in the environment that the project has no control or influence on. This generally impacts decision-making and information flow (Remington *et al.*, 2007). Environment stability and political climate (Bosch Rekveldt *et al.*, 2011; Remington *et al.*, 2007; Xia and Lee, 2005).

Table 1 shows the four categories of complexity that relate to the types of complexities identified as presented in literature.

2.3 Complexity of IT-enabled change projects

IT-enabled change projects lead to the redesign of organisation processes or procedures as part of introducing an IT system (Klaus *et al.*, 2015). Iveroth (2010) presented how IT-enabled change projects within a multinational telecommunication company called Ericsson led to the introduction of an Enterprise Resource Planning system in multiple locations. This change was introduced due to the need for cost savings and other reasons such as the lack of global unified processes and IT systems. To achieve this, processes across global sites were standardised and consolidated. The implementation of the new IT system as part of the IT-enabled change project required the organisation's processes and procedures to be redesigned. The current processes were analysed to identify the end state that required either radical or incremental changes. The new IT system was used to support the restructured organisation along with the new culture (Iveroth, 2010). An organisation's ability to change its procedures and processes impacts the success of introducing radical changes as part of IT-enabled change projects (Cordella and Iannacci, 2010; Deloitte Access Economics, 2015; Gunasekaran and Nath, 1997).

IT-enabled change projects can be described as complex projects because there are several aspects involved such as changes to the organisational structure, cultural behaviours, process re-engineering and the introduction of a new IT system (Turner and Cochrane, 1993; Weerakkody *et al.*, 2011). The level of complexity is variable within IT-enabled change projects. Several contributing factors can influence the level of complexity within these projects. This includes the size of the project, the number of stakeholders involved, new technology, lack of understanding (Murray, 2000). Complexity also occurs in IT-enabled change projects because it is difficult to get clarity on what the end product will be. Unlike tangible end products, the delivered software is intangible as stakeholders may interpret the end product differently and there are continuous changes to what has to be delivered (Atkinson *et al.*, 2006; Hassan and Asghar, 2021; Xia and Lee, 2005). Whitney and Daniels (2013) described IT-enabled change projects as Complex Adaptive Systems. Firstly, they are non-linear due to the inability to represent the components and subsystems as a whole. Secondly, they are also non-ergodic because they have limited control as they interact with their environment. Finally, they are emergent due to their ability to evolve while responding to inputs.

An adaptive project management approach is the preferred approach for managing complex IT-enabled change projects rather than a reductionist approach that involves

Contributing factors	Types of complexities	Journal papers
Uncertainty in technical areas		
Experience with technology/new technology	Technological complexity	Bosch Rekveldt *et al.* (2011)
	Technical complexity	Remington and Pollack (2007)
	Uncertainty complexity	Turner and Cochrane (1993)
		Williams (1999)
	Complexity of faith	Geraldi and Adlbrecht (2007)
	Dynamic IT complexity	Xia and Lee (2005)
Technical dependencies	Technical complexity	Remington and Pollack (2007)
	Technological complexity	Bosch Rekveldt *et al.* (2011)
	Dynamic IT complexity	Xia and Lee (2005)
Trust in project team (as autonomy is required – flat hierarchies)	Technical complexity	Remington and Pollack (2007)
	Organisational complexity	Bosch Rekveldt *et al.* (2011)
Uncertainty in goals and deliverables		
Deliverable changes/specification changes	Unnamed complexity	Whitney and Daniels (2013)
	Dynamic complexity	Geraldi *et al.* (2011)
	Dynamic IT complexity	Xia and Lee (2005)
	Technological complexity	Bosch Rekveldt *et al.* (2011)
	Uncertainty complexity	Williams (1999)
Uncertainty in goals	Dynamic complexity	Geraldi *et al.* (2011)
	Directional complexity (as a result of stakeholders and their interaction)	Remington and Pollack (2007)
	Complexity of faith and fact	Geraldi and Adlbrecht (2007)
	Dynamic IT complexity	Xia and Lee (2005)
	Technological complexity	Bosch Rekveldt *et al.* (2011)
Planning issues due to on-going changes in scope	Structural complexity	Remington and Pollack (2007)
Conflicting interest	Directional complexity (as a result of stakeholders and their interaction)	Remington and Pollack (2007)
	Socio-political complexity	Geraldi *et al.* (2011)
	Complexity of interaction	Geraldi and Adlbrecht (2007)
	Environmental complexity	Bosch Rekveldt *et al.* (2011)

(*continued*)

Table 1.
Four categories of complexity

Contributing factors	Types of complexities	Journal papers
Project organisational aspects		
Interdependence	Organisational and technological complexity	Baccarini (1996)
	Structural complexity	Remington and Pollack (2007) Geraldi *et al.* (2011)
	Structural organisation complexity	Xia and Lee (2005)
	Environmental complexity	Bosch Rekveldt *et al.* (2011)
Project size and variety	Organisational and technological complexity	Baccarini (1996)
	Complexity of interaction	Geraldi and Adlbrecht (2007)
	Structural complexity	Remington and Pollack (2007 Geraldi *et al.* (2011)
	Structural organisation complexity	Xia and Lee (2005)
	Organisational	Bosch Rekveldt *et al.* (2011)
Skills availability	Organisational	Bosch Rekveldt *et al.* (2011)
Environment constraint	Structural complexity	Remington and Pollack (2007)
Urgency and criticality of time frame	Pace complexity	Geraldi *et al.* (2011)
Environmental aspects		
Environment stability (mergers, acquisition, leadership changes)	Temporal complexity	Remington and Pollack (2007)
	Dynamic organisation complexity	Xia and Lee (2005)
	Environmental complexity	Bosch Rekveldt *et al.* (2011)
Political climate	Temporal complexity	Remington and Pollack (2007)
	Environmental complexity	Bosch Rekveldt *et al.* (2011)

Table 1.

delivering projects to time, cost and specification by applying the plan and control or command and control approach (Hass, 2009). Generally, both hard and soft skills are known to be used in project management. Hard skills or the command-and-control approach often refer to the use of processes, procedures, tools and techniques to manage projects. Whereas soft skills refer to managing issues that relate to people within the project context (Azim *et al.*, 2010). Atkinson *et al.* (2006) identified two types of projects known as hard and soft projects. Soft projects have intangible goals and objectives at the start with different interpretations and expectations from a number of stakeholders. On the other hand, hard projects generally start with clearly defined goals and these projects aim to deliver a tangible product such as a building or equipment. Project management has been criticised for being too focussed on using hard skills to manage all kinds of projects (Atkinson *et al.*, 2006). Soft projects require flexibility and the acceptance of uncertainty due to the very high level of uncertainty within the project (Atkinson *et al.*, 2006). Tools and techniques as part of hard skills used in project management such as resource allocation, network planning and risk analysis are ideal for hard projects that are isolated from environmental influences. These tools are less reliable and more difficult to use when the project boundaries are more permeable as they become soft projects (Atkinson *et al.*, 2006). This understanding of projects has led to shifting the current project management approach from applying the command-and-control approach to identifying uncertainty and complexity while applying soft skill as part of communicating and influencing stakeholders (Weaver, 2007). Both hard and soft skills are important when it comes to managing complex project (Azim *et al.*, 2010). An adaptive project management approach like Agile project management methodologies are widely applied to managing IT-enabled change projects as they are suitable for projects that require some flexibility (Serrador and Pinto, 2015; Whitney and Daniel, 2013). Soft skills are important in ensuring that the deliverables of the project are continuously reviewed, feedback is provided on system prototypes leading to adjustments being made when they are required and re-scoping of project requirements when new information is received or due to customer requests. Hard skills are required in monitoring and tracking what will be delivered by the project also known as the product backlog and what will be delivered by each sprint also known as a Sprint back log (Cervone, 2010).

3. Research methods

The present research is exploratory in nature as it seeks to gain an understanding of the "social reality" of Australian IT professionals and business stakeholders when they take part in the completion of complex IT-enabled change projects (Jupp, 2006). To answer the research questions posed, this research was designed based on the examination of case studies. Case studies are required to describe the social realities that project managers face when dealing with complex IT-enabled change projects. Moreover, case studies allow the investigator to complete an in-depth examination of a complex social phenomenon while retaining the characteristics of real-life events (Yin, 2014). A multi-case design from a single company was used in this research to describe the replication logic as part of identifying consistent patterns of behaviours across each case (Eisenhardt, 1989; Yin, 2014).

3.1 Case study selection

The concept of using IT systems to enable business transformation is the focus of an IT-enabled change. Transformation takes an organisation from its "as is" to the "to be" state with radical changes in the structure of the organisation, culture and business processes as part of the introduction of a new IT system (Weerakkody *et al.*, 2011). The research focusses on identifying contributing factors that lead to complexity which impacts the performance of IT-enabled change projects. It also focusses on identifying management approaches and stakeholder perception of success.

The study uses embedded case studies that were conducted within a single company that provided access to various project stakeholders working on three different IT-enabled change projects. The company is a global organisation that at the time of the research employed 21,511 employees in Australia and New Zealand. Three cases were selected because they were IT-enabled change projects that met the selection criteria. A new IT system was implemented to enable organisational change. The sampling method applied to the case study was purposive sampling, as randomly selected samples are not preferred (Eisenhardt, 1989). This sampling method allowed the researcher to use judgement in selecting the cases that provided the information required (Chapman and Mcneill, 2005; Saunders *et al.*, 2007). The following three cases investigated were:

(1) *Project A:* Customer Service (CS) Project

(2) *Project B*: Global Human Resources (HR) project

(3) *Project C:* Knowledge Management (KM) Project

Project A ran from 2016 to early 2018. While Project B and C ran from 2016 to the last quarter of 2017. The details related to the three cases are presented in Table 2.

3.2 Data collection

The case study method requires data to be collected from multiple sources and triangulated to ensure that robust results are obtained (Yin, 2014). The options which are available for data collection techniques within a case study includes interviews, observations, document analysis and questionnaires (Eisenhardt, 1989; Saunders *et al.*, 2007). As part of the current study, data were collected from three case studies primarily using semi-structured interviews from multiple participants within each case and project documentation which justifies multiple sources. Data triangulation was the selected triangulation method that was used because the research questions are aimed at gathering individual perceptions from various project stakeholders (Yin, 2014). Denzin (2009) acknowledges that data triangulation can occur by using the same data collection method when the data is collected from multiple sources. Triangulation was performed by comparing information from interviews with project documentation and interview responses gathered from participants on the same and different projects. Saturation was reached after comparing information from interviews with project documentation and interview responses gathered from participants on the same project. As well as analysing the data collected from participants from each project. This included four participants from Project A and B and two participants from Project C.

Area of interest	Project A – customer service project	Project B – global human resources (HR) project	Project C – knowledge management (KM) project
Background information	Involved the introduction and enhancement of the customer service capability within the contact centre. It also involved an IT infrastructure upgrade and the introduction of a new technical design	Involved the introduction of a new HR system to support a new centralised HR function that supports several business areas within the organisation in Australia and New Zealand	Involved the introduction of a new knowledge management IT system within the organisation
Organisation change description	Involved organisational change that led to the introduction of multiple customer service systems and enhanced features within one of the existing systems, new team structure, a new channel of interaction with customers and new technical capabilities that allowed better interaction with customers	Involved organisational change that led to the introduction of an HR information system supported by standardised global processes, a new team structure and new technical capability for data collection and analysis	Involved organisational changes in business processes while introducing the new knowledge management system supported by best practice knowledge management processes and new technical capability for knowledge management
Financial cost of the project in Australian dollars	4–5 million	6–7 million	1–2 million
Number of impacted departments or employees	361 employees This project mostly impacts customers	100% of company employees across Australia and New Zealand (21,511 employees)	2,000 to 3,000 employees

Table 2.
Summary of the three selected case studies

All of this led to the conclusion that no additional data was needed (Elo *et al.*, 2014; Fusch and Ness, 2015; Saunder *et al.*, 2007). The data collection technique is described in the sections below. The details of participants are presented in Table 3.

3.2.1 Semi-structured interviews. Interviews are regarded as an important source of information in case study research (Yin, 2014). All interviews were recorded and transcribed. The interviews were conducted from the 18th of September 2017 to the 16th of February 2018. Ten participants were interviewed. Projects A and B had four participants and Project C had two participants. All interviews lasted between 30 and 90 min. Interviews were conducted face-to-face, skype video conferencing and via telephone. Semi-structured interviews were selected as the primary method of data collection because the research questions are aimed at investigating perceptions of project stakeholders. Semi-structured interviews allowed the research to gather stakeholder perception that was used to gain an understanding of how complexity impacts the performance of IT-enabled change projects and how stakeholders perceive the success of IT-enabled change projects (Chapman and Mcneill, 2005). The approach was to ask the participants questions that relate to identifying specific complexity contributing factors. For example, for uncertainty in goals and deliverables, the question asked was "Were the goals or deliverables of the project agreed by multiple stakeholders at the start of the project?" The answer to the question helped identify the presence of a complexity contributing factors. This helped to link the presence of complexity to failure to meet the Iron Triangle success measures.

3.2.2 Project documentation. A variety of project documentation were used as a source of information. Project A documents included the project handbook, project scoring document and the lessons learned document. Project B documents included an audit report and the lessons learned document and Project C documents included the project handbook, change impact assessment, Go or No-Go pack, project scoring and the lessons learned document. These documents provided information on the background of the projects and the change introduced by the projects.

3.3 Data analysis

Data collected from the semi-structured interviews was transcribed and imported into a software tool for analysing qualitative data known as NVivo. The data was analysed using two qualitative approaches known as thematic analysis and cross-case analysis. Thematic analysis is a popular qualitative analytic method within social science (Braun and Clarke, 2006). As part of thematic analysis, themes emerged while analysing qualitative data from each case study by using consistent codes and theme names.

Participant	Age group	Gender	Years of experience
Project A–business analyst (BA)	41 to 50	Female	10 years in IT projects
Project A–project manager (PM) 1	31 to 40	Male	15 years in project management 7 years in IT project management
Project A–project manager (PM) 2	41 to 50	Male	20 years in project management
Project A–head of contact centres	50 and over	Female	No experience in IT projects
Project B–business analyst (BA)	50 and over	Male	Over 10 years in IT projects
Project B–project manager (PM)	30 to 40	Male	Over 10 years in project management
Project B–continuous improvement manager	41 to 50	Female	No experience in IT projects
Project B–tester	20 to 30	Female	9 years in IT projects
Project C–scrum master	41 to 50	Male	10 years in project management
Project C–knowledge solutions manager	41 to 50	Female	20 years in project management

Table 3. Overview of participants

Thematic analysis was selected because this analysis approach aligns with the need to gain deep insights into how complexity impacts the performance of IT-enabled change projects. It minimally organises and describes the data set in detail. Braun and Clarke (2006) described the thematic analysis as a method that can be used to identify, analyse and report patterns (themes) within data. Themes can emerge or be discovered while analysing qualitative data.

As part of thematic analysis, both open and axial coding were used to code the data. The open coding technique requires text identified in the transcript to be allocated a code. Whereas axial coding involves allocating categories to codes generated as part of open coding. Themes were identified after a pattern was found in the coded responses of interviewees. This involved combining different categories or codes to form a theme that relates to the research question that was being asked. A theme does not necessarily need to occur in all interviews that the selected case study applies to. As the research is exploratory in nature, the data was coded without using codes that were pre-defined. This is known as a data-driven approach to thematic analysis (Yin, 2014).

A cross-case analysis was used to compare the themes and categories across the cases (Mathison, 2005; Yin, 2014). This analysis is often the second level of analysis that is used for a case study approach to identify common outcomes such as similarities and differences across cases. A visual representation like a table is often used to identify similarities and differences across cases. Eisenhardt (1989, p. 541) states that cross-case analysis "force investigators to go beyond initial impressions, especially through the use of structured and diverse lenses on the data."

4. Results

The results section describes the results in relation to the research questions.

4.1 Overview of themes and findings

The three tables show the themes that occurred within each case and across the three cases. Table 4 shows that technical uncertainties, uncertainties related to goals and deliverables and project organisational aspects were the only identified categories of complexity that occurred. Complexity contributory factors that relate to environmental aspects were not identified in any of the projects.

The sub-themes that capture stakeholder's perception of success and success that focussed on the iron triangle are listed in Table 5.

The sub-themes that capture good and poor stakeholders relationships are listed in Table 6.

5. Findings

5.1 Impact of complexity on the performance of IT-enabled change projects based on the iron triangle

The first step towards answering the first research question was to identify the complexity contributing factors that exist within the three IT-enabled change projects. The research reveals that identifying the presence of the types of complexity contributing factors can provide an understanding of the impact of complexity on the performance of IT-enabled change projects. As listed in Table 4, it was found that technical uncertainties and uncertainties related to goals and deliverables were present in all three cases. Complexity contributory factors related to the organisational aspects were only present in *Project B*. Complexity contributing factors related to environmental aspects of complexity were not identified in any of these projects. The discussion section presents an explanation of the

Contributing factors	Sub-themes	Description of themes	Projects A	B	C
Technical uncertainties					
Experience with technology/new technology	New technology	New technology was introduced as part of this project	√	√	√
	Difficulty resolving technical issues	Technical issues occurred that were difficult to resolve	–	–	√
	Implementation issues	At the time of implementation there were a lot of issues raised by the impacted teams	–	√	–
	Large number of technical issues	There were a lot of technical issues raised	–	–	√
	Vendor issues impacted delivery time	The vendor caused delays	√	–	–
	Vendor dependency	There was a dependency on the vendor to support the implementation of the new system	√	√	√
	Unexpected cost	There was unexpected cost due to new issues or scope of work arising	√	–	–
	Project team used tools that were not planned for	Ad-hoc tools were used by the project team without prior training	–	√	–
Technical dependencies	High technical dependencies	Multiple systems were integrated with a lot of system dependencies	–	√	–
Uncertainty in goals and deliverables					
Deliverable changes/ specification changes	Change in deliverables	Deliverables changed as the project progressed	√	√	√
	Change in delivery date	The delivery date changed as the project progressed	√	√	√
Uncertainty in goals	Changed objectives	The objectives changed as the project progressed	√	–	–
Planning issues due to on-going changes in scope	Planning issues	There were planning issues due to lack of understanding of what had to be delivered	–	√	–
Project organisational aspects					
Project size and variety	Global stakeholders	Stakeholder were from the UK, Australia and New Zealand	–	√	–
Interdependence	Dependency on multiple departments	The project was dependent on multiple departments to implement the new system	–	√	–
	Dependency on other projects	The project had some dependencies on other projects	–	√	–
	Global design dependency	The project was constrained and dependent on global designs that had to be followed at the time of implementation	–	√	–
Urgency and criticality of time frame	Unrealistic deadline imposed	The project had an unrealistic deadline imposed	–	√	–

Note(s): –This indicates that the item was not captured, √ this indicates that the item was captured

Table 4. Overview of complexity

Themes	Sub-themes	Description of themes	Projects A	B	C
Perception of success focused on deliverables	Business change introduced	Success was due to organisational change introduced to teams impacted	√	√	–
	System is in place	Success was due to the introduction of a new system to teams that are currently using the system	–	√	√
	Happy stakeholders	Success was due to stakeholders being happy with the outcome of the project	√	–	√
Perception of traditional measures	Objectives met	Project objectives were met as part of delivering the project	√*	√	√
	Delivered original specification	The project delivered the original specification	x	x	x
	Delivered within the original time	The project delivered within the original time that was agreed	x	x	x
	Delivered to time agreed	The project delivered to the time frames agreed with stakeholders	–	–	√
	Delivered to original budget	The project delivered to the original budget	√	–	–
	Delivered to budget agreed	The project delivered to the budget agreed with stakeholders	√	√	–

Note(s): *This indicates that the project objectives changed, – this indicates that the item was not captured, √ this indicates that the item met the measured criteria, x this indicates that the item did not meet the measured criteria

Table 5.
Sub-themes for project success

Themes	Sub-themes	Description of themes	Projects A	B	C
Good stakeholder relationship	Good communication	The project team had regular communication with stakeholders. There was transparency and stakeholders could see progress made	√	–	√
	Simple communication channels	There were simple communication channels due to no internal dependencies on deliverables and stakeholders being from one department	√	–	√
	Stakeholder ownership	Stakeholders were involved in the decision-making process	–	–	√
	Understanding stakeholders	Stakeholders were flexible with the delivery date of the project as they allowed it to change	√	–	–
	Trust in IS team	Trusting relationship with the information system team	–	–	√
Poor stakeholder relationship	Negative feedback from employees	Employees were unhappy due to the change introduced. Employees also felt that the new system had exposed flaws in their ways of working	–	√	
	Increase in workload	System introduced administrative tasks that were not previously required	–	√	–
	Poor change management/ Not enough support given	Not enough support provided at the time changes were introduced	–	√	–

Note(s): –This indicates that the item was not captured, √ this indicates that the item was captured

Table 6.
Sub-themes for stakeholder relationship

presented results and why complexity contributing factors that relate to the environmental aspects of complexity were not identified.

5.2 Technical uncertainties

Technical uncertainties occurred in all the IT-enabled change projects, but the most common contributor to technical uncertainties was the introduction of new technology and the fact that there was reliance on a software vendor to support the project. There is a higher level of uncertainty associated with introducing an external organisation. The new technology introduced uncertainties, as it had not been used within the organisation before. Technical uncertainty contributors included difficulty in resolving technical issues, high technical dependencies, implementation issues and others listed in Table 4. It is clear that the organisation was adopting new technology to support its desire for change in all three projects. The new technology and the delays that occurred in all three projects were described by participants.

Some descriptions of technical uncertainties include:

(1) The *Project A–Business Analyst* expressed that vendor availability resulted in some delays in the project.

(2) The *Project A–Project Manager (PM)* B described the impact the vendor had as new scope of work was discovered because the vendor had failed to recognise the need for the work earlier.

(3) In *Project C* some technical issues impacted how much work could be completed. *The Project C–Scrum Master* expressed that there were delays due to technical issues.

5.3 Uncertainty in goals and deliverable changes

Complexity contributing factors related to uncertainty of goals and deliverables occurred in all projects, even if the stakeholders were aligned to the goals of these projects or senior management support was given at the start of the projects. Yet, in all cases, as the projects progressed, there were changes in the deliverables of the project. User needs or scope evolved or changed as the projects progressed. All these projects reprioritised and changed the deliverables as they progressed. As a result of this, the delivery date of these projects was changed. This implies that uncertainty of goals and deliverables has a negative impact on the time and deliverables/meeting original specification measurement within the iron triangle success measure.

For *Project B*, there were planning issues as there was simply a lack of understanding of what had to be changed in the current business environment before the project started. This led to identifying newly discovered work as the project progressed.

(1) The *Project B–Project Manager* explained that as the project progressed, it became clearer how much work was required.

(2) The *Project B–Continuous Improvement Manager* described how new systems were implemented on the fly.

The scope and size of *Project B* changed as the project progressed. For example, there were more systems to integrate than that was originally thought of leading to more work than originally anticipated to integrate the systems. The scope creep resulted in implementing a system that increases the administrative burden and consists of on-going issues.

Project A and *C* applied the agile project management approach to reprioritise deliverables as the projects progressed. There were also changes in the deliverables of these projects as the project progressed. *Project C* also applied an approach that committed to leaving a team to improve and make changes to the system after the project was completed. The objectives of *Project A* changed as the project progressed because it started with a business case that overpromised on cost savings due to a reduction in the number of employees required. As the project progressed, it became evident that it was not going to be possible to meet the initial objectives. The business objectives were adjusted once this discovery was made.

5.4 Organisational aspects

Complexity contributing factors that relate to organisational aspects that were found to only occur in Project B. This was a very ambitious project that consisted of global stakeholders and the sponsorship of the project came from the most senior levels of the organisation across the globe. The project was initiated at the highest level of the organisation. Complexity contributing factors were identified due to the number of departments involved, dependency on other projects and dependency on global stakeholders. The Australian and New Zealand part of the project involved implementing global processes that were pre-defined for application within multiple HR departments across several business units in Australia and New Zealand. The change was described as a culture shock within the organisation. Changes to the proposed process changes were only allowed if there were legal requirements.

The project kicked off without a full understanding of the diverse range of processes that were present within the organisation. There was a tight deadline imposed on the project team.

(1) The *Project B Continuous Improvement Manager* described the timelines imposed as aggressive.

Project B was the only project that experienced poor stakeholder relationship due to the negative perception of the changes introduced and the negative behaviours from stakeholders. Poor stakeholder relationship included:

(1) Negative feedback or behaviour from employees as a result of the changes introduced. Some employees left the organisation or had responded negatively to the change.

(2) Employees felt there was an increase in workload as a result of the new IT system.

(3) The project team felt that not enough support was given to employees impacted by the change.

With complexity contributing factors related to uncertainty in goals and deliverables already within the project, there was not a lot of focus on managing the change within the organisation. The negative perception of the change and the negative behaviours were due to the uncertainties of the changes that were being introduced. More attention should have focussed on the users of the system at an earlier stage of the project. Some descriptions of people's perception of the change include:

(1) The *Project B–Project Manager (PM)* described people's view of the project as an increase in administrative burden.

(2) The *Project B–Business Analyst (BA)* felt that the system actually increased workload

(3) The *Project B–Continuous Improvement Manager* felt that support was provided much later than it was required.

5.5 Stakeholders perception of success of IT-enabled change projects and the management approach applied

To answer the second research question, data was analysed to gain an understanding of whether stakeholders perceived the IT-enabled change projects to be successful.

All interview participants expressed that the projects under study were successful because either the business change was introduced, or the system was delivered, or stakeholders were happy. Participants felt that it was important for the system to be delivered with some key requirements.

From a traditional standpoint of measuring success based on the iron triangle, all interviewees confirmed that none of the projects delivered to the original time and specification, yet stakeholders felt that the projects were successful. There was no documentation available to confirm that any of these projects were delivered to the original budget but multiple stakeholders from *Project A* confirmed that some money was taken away from the project because the project was within the budget requirements. Although the *Project B–Project Manager and the Project C–Scrum Master* confirmed that the projects were delivered to the agreed budget, this may or may not be the original budget. Note that this was not confirmed by a second participant. All interviewees confirmed that the objectives were met in all projects. Some of the different perceptions of success included the following:

(1) *Project B–Project Manager* described implementing the key features of the system as part of describing the success of the project.

(2) The *Project A – Project Manager B* had expressed that he viewed the project as successful because the project continuously delivered functionality throughout the year.

These new systems introduced as part of the IT-enabled change projects led to visible organisational changes and stakeholder feedback showed that there were also clear benefits of introducing the system.

(1) The *Project A–Project Manager B* had described the changes introduced as changes that could be seen.

Both *Project A* and *C* participants had received positive feedback from stakeholders who had expressed the success of the project.

(1) The *Project A – Project Manager B* described the positive feedback he had received from stakeholders.

(2) The *Project C – Knowledge Manager* described the positive feedback she had received from stakeholders.

The *Project B–Project Manager* had emphasised the benefit of delivering the system despite the negative feedback they had received. The *Project A–Project Manager B* had also emphasised the benefits of delivering the system despite delays or challenges. The *Project C–Knowledge Manager* also described the benefit of the system despite the challenges that were faced. Overall stakeholders viewed all the projects as successful.

Good stakeholder relationship was built through good communication in the *Projects A* and *C*. Stakeholders were regularly communicated to via several channels. Again, for both projects, all the stakeholders were from one department which led to simple communication channels. As part of *Project C*, key stakeholders were involved in the decision-making process when issues occurred. For *Project A*, stakeholders were flexible with the time of delivery. Good communication reassured stakeholders about what would be delivered and the direction of the project. The project structure and the application of Agile project management approach in *Project A* and *C* allowed stakeholders to remain involved in the reprioritisation of requirements and to gain visibility of progress made. Communication was easier in *Project A* and *C* as all the stakeholders were from one department. This made it easier to manage and agree on the goals and deliverables of the project.

(1) *Project A – Business Analyst* described the constant communication between the project team and business or business leads.

(2) *Project C -Scrum Master* described the reason there was a good relationship with stakeholders as having transparent communication with a published backlog and showcasing the progress made.

6. Discussion

A novel attempt has been made within this article to extend the identification of contributing factors of complexity for providing an integrated vision of complexity, management approaches and their impact on project performance. It also attempts to compare stakeholder perception of success compared to the iron triangle success measure. As seen in the literature review, complexity is multifaceted and different types of contributing factors can be classified by using multiple frameworks. For IT-enabled change projects, this study categories complexity contributing factors into four categories that are based on existing literature and it used in-depth case studies to describe real-world challenges faced, the management approach and the impact of complexity on project success measures. Only three of the categories of complexities had contributing factors present in the case studies. Technical uncertainties and uncertainty in goals and deliverables occurred in all three case studies. Complexity contributing factors for the organisational aspects of complexity was only identified in one case study. None of the case studies had complexity contributing factors that relate to environmental aspects of complexity. This could be because all the projects were conducted in the same organisation and at the time complexity contributing factors like mergers or acquisitions were not present. It also identified a misalignment between stakeholder perception of success in complex IT-enabled change projects and the iron triangle success measures. These are important findings because although other success measures have been identified by researchers there is still a lack of a holistic view of how different complexity contributing factors impacts project performance and a lack of appropriate success measure that best suits complex IT-enabled projects (Serrador and Turner, 2015).

Uncertainty in goals and deliverable changes negatively impacted the performance of all three projects based on the iron triangle but it did not have an impact on stakeholder perception of success. All projects changed their deliverables which led to failure to meet the time and original specification requirements. This aligns with previous research that identified that projects with a higher level of complexity also have a high level of uncertainty at the beginning when the project scope is not well defined. Changing requirements and deliverables are known to occur as these projects progress (Atkinson *et al.*, 2006; Whitney and Daniel, 2013). IT-enabled change projects are known to fail due to changing requirements and unclear deliverables (Whitney and Daniels, 2013; Kogekar, 2013). *Project A* and *C* used the Agile Project Management approach to involve stakeholders in the decision-making process when there was a need to alter and reprioritise the deliverables of these projects. Whereas *Project B* simply altered and reprioritised deliverables when it was needed. It is clear that applying a flexible approach towards project management ensures that complex IT-enabled change projects can accommodate changes made to their deliverables as they progress due to the presence of uncertainty in goals and deliverables. These findings support the claim that an adaptive project management approach and soft skills that allow stakeholders to be involved in the decision-making process are required to help improve the performance of these projects due to the changing landscape (Atkinson *et al.*, 2006; Hass, 2009).

The findings also show that technical uncertainties negatively impacted all three projects as they all adopted new technology. The uncertainty around new technology led to delays as new technical, vendor or implementation issues occurred within all projects and there was a dependency on the vendor to provide guidance and resolve issues. This aligns with previous research that shows that using new technology that has not been previously developed or used successfully in other organisations is viewed as a risk factor to IT-enabled change projects failure (Whitney and Daniels, 2013; Schmidt *et al.*, 2001). Introducing an external organisation can lead to a higher level of uncertainty (Atkinson *et al.*, 2006). Vendor issues were also identified as part of technical uncertainties which had a negative impact on project success measures. Hughes *et al.* (2016) noted that poor vendor relationship is linked to factors that contribute to project failure. As all projects reprioritised or changed deliverables due to delays caused by complexity contributory factors related to technical uncertainties. An adaptive project management approach is required to accommodate the need to reprioritise and change deliverables due to delays or issues caused by the presence of technical uncertainties (Atkinson, 1999; Hass, 2009). Again, these projects were perceived as successful despite the presence of these factors that contribute to complexity.

Complexity related to the organisational aspects and poor stakeholder relationships were only reported in *Project B* which was the largest project. This aligns with previous research which links complexity to communication issues as well as other non-technical aspects of the project like behavioural and social issues (Antoniadis *et al.*, 2011). Firstly, the negative influence of complexity contribution factors related to the organisational aspects on the performance of *Project B* aligns with the 2012 Gartner report that suggested that larger projects are more prone to the risk of failure to meet the iron triangle requirements (Alami, 2016). Secondly, the presence of poor stakeholder relationship as a negative influence on *Project B* aligns with earlier results found by Schmidt *et al.* (2001). They found that stakeholder relationship is a risk factor that has been identified and linked to IT-enabled change project failure. Whereas good stakeholder relationship was identified in both *Project A* and *C* as an enabler for these projects. Using soft skills as part of good communication to establish good stakeholder relationships helped to involve stakeholders in the decision-making process that occurred due to the continuous changing landscape of these projects. Stakeholders were involved when there was a need to reprioritise deliverables and they were informed about delays and challenges faced. This seems to be a key factor in ensuring that these IT-enabled change projects were delivered. The findings support the claims that soft skills are key to managing complex projects (Azim *et al.*, 2010).

The study also revealed that the stakeholders of the three projects perceived that these projects were successful regardless of the fact that they did not meet the traditional measurement of success for time and specification. Despite the challenges that the projects faced, all stakeholders participating in the research believed that these projects were successful because either they delivered the IT system or business change that supports the long-term goals of the organisation or stakeholders were happy with the outcome of the project. Stakeholder perception of success did not align with the traditional measure of success, as all three projects scored poorly when it came to the traditional success criteria for time and specification. The three projects studied faced delays and the original scope of these projects changed over time which meant they did not deliver everything that they intended to deliver. This finding is consistent with previous studies that have found that stakeholders may perceive a project to be successful despite the project failing to meet the needs of the iron triangle (De Bakker *et al.*, 2010; Wateridge, 1998). This finding also supports the claim that it is very difficult to measure the success of soft projects by only using quantitative measurements like cost, time and quality. It is also best to rely on qualitative measurements (Atkinson *et al.*, 2006, p. 692).

As researchers have argued that the iron triangle success measure cannot simply be abandoned, the findings show the importance of understanding the project context while reviewing project success.

7. Conclusion

This is an original paper that combines significant previous research on complexity contributing factors to project performance of IT-enabled projects with results from a qualitative analysis of the perception of major stakeholders of three case studies in Australia and New Zealand. It proves that stakeholders take a broader view of success than the standard iron triangle and that management approaches that include communication and project management approach should focus on complexity contributory factors related to technical uncertainties, uncertainty in goals and deliverables and organisational aspects within IT-enabled change projects.

In recent years, researchers have continually criticised IT-enabled change projects for their failure to meet the iron triangle success and additional measures. These failures are often highlighted in the review of government IT-enabled change projects (Brouwer, 2011; Parliamentary Office of Science and Technology, 2003), by researchers (Hughes *et al.*, 2016, 2017) and IT magazines like the CIO (Kogekar, 2013; Pratt, 2017) and the CHAOS report (Hastie and Wojewoda, 2015) that focus on multiple projects that include government and non-government IT-enabled change projects. Although there is a lot of interest in the reasons why IT-enabled change projects fail, there are significant gaps in the understanding of how complexity impacts the performance of IT-enabled change projects and the approach that can be taken to manage or determine appropriate success measures for these projects. The study addressed this issue by conducting multi-case studies of three complex IT-enabled change projects in Australia. It identified the complexity contributing factors that exist in complex IT-enabled change projects. It also explains how complexity impacts project performance and it presents stakeholder's perception of success.

The study contributes to the literature on IT-enabled change projects in three ways. Firstly, the study describes how complexity negatively impacts the performance of IT-enabled change projects when the success criteria are based on traditional measures such as cost, time and specification. The complexity themes identified in this study show that complexity contribution factors related to technical uncertainties, uncertainty in goals and deliverable and project organisational aspects all impact the performance of IT-enabled change projects. It also shows that complexity contributing factors that relate to the organisational aspect were found to make the impacted IT-enabled change project more difficult to manage as it was linked to poor stakeholder relationship. Secondly, it shows that an adaptive project management approach along with good communication is key to aligning and involving stakeholders in the changing landscape of complex IT-enabled projects. Finally, the success measure themes shed some light on how stakeholders perceive the success of complex IT-enabled change projects that did not meet the performance requirements of the traditional measures. Stakeholders view success to be more than delivering to cost, time and specification as these projects were viewed to be successful even if they did not meet these success measures. Stakeholders remained focussed on the deliverables of these projects. The stakeholders felt these projects were successful because business change was delivered, the IT system was in place and stakeholders were happy with these projects. The findings align with previous research that suggest that a broader view of success should consider the context of the project (Atkinson, 1999). This research encourages project management practitioners to focus on understanding project complexity to adequately manage these projects and review their performance.

The study has two main limitations. Firstly, although the study provides rich information about the impact of complexity on the performance of IT-enabled change projects and stakeholders perception of success, further data collection from a quantitative study will help to contribute to strengthening the findings of the research. Secondly, none of the case studies identified complexity contributing factors that relate to the environmental aspects of complexity. It is recommended that future research should focus on gathering data that measures the level of impact of each type of complexity as part of a quantitative study with data from multiple organisations. This will help determine the variation in the level of impact of each type of complexity and support generalising the findings.

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