IT GOVERNANCE AS A HIGHER ORDER CAPABILITY

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Abstract

This paper utilises the resource-based view as a framework to examine the interactions between information technology (IT) governance, IT management and organisational information systems. Analysis of data collected from medium and large Australian organisations indicates that IT governance capabilities act to improve IT management capabilities which in turn improve the performance of organisational information systems, specifically future-oriented accounting information systems. We propose that these interactions represent the operation of an overarching organisational IT capability. Further analysis finds significant differences in the most effective combinations of IT governance and IT management mechanisms for organisations facing differing levels of environmental turbulence. This finding highlights the importance of utilising IT governance as a higher order organisational capability to reconfigure and align capabilities and resources in response to changing strategic requirements and environmental pressures.

1   INTRODUCTION

Almost all organisations invest significant amounts of time, effort and money on creating and maintaining information technology (IT) management skills and technology-based information systems (IS). Identifying reliable methods for improving the value generated by IT-related investments is an issue of great relevance to practice. It is also an issue that has been the subject of extensive IS research (Hitt and Brynjolfsson 1996, Dehning and Richardson 2002, Chau et al. 2007). It has become evident that organisations cannot simply "throw money" at organisational IT hoping for a good outcome, and that reliably generating value from IT investments is a difficult task, contingent on many factors. Organisations seeking to maximise the value obtained from these investments are encouraged to implement and follow best practice guidelines for the governance and management of IT, such as the international standard for Corporate Governance of Information Technology, ISO/IEC:38500, and the Control Objectives for Information Technology (COBIT) framework (ISACA 2012). This paper seeks to address calls for further research on IT governance (Sohal and Fitzpatrick 2002, Bowen et al. 2007, Prasad et al. 2010, Wilkin and Chenhall 2010) by highlighting how organisations use IT governance to establish and maintain high performing IS, as well as examining this issue with reference to changing levels of environmental pressure.

The resource based view of the firm (RBV) has been a useful theory base for prior IS research (Mata et al. 1995, Bharadwaj 2000, Wade and Hulland 2004) and this paper uses RBV as a framework with which to examine the relationships between IT governance, IT management and IS performance. While a substantial amount of previous research has considered how IT management skills and IS are viewed under of RBV, consideration of the role of IT governance is less common.

IT governance research often focuses on providing normative guidance for practice (Peterson 2004, De Haes and Van Grembergen 2009, Grant et al. 2007, Wilkin and Chenhall 2010). Conversely this paper will extend our understanding of IT governance in practice by examining the influence that effective IT governance has on IT management and IS in the context of Australian organisations. A further contribution is made by developing a theoretical model that demonstrates the role of IT governance as a component of an overarching organisational IT capability (Bharadwaj 2000). Finally, this paper also expands on the previous research by considering the role of IT governance as a higher order capability that can reconfigure and realign other capabilities to improve organisational outcomes (Winter 2003).

The remainder of the paper is organised as follows: the next section provides further discussion of existing literature and theory. The research model and hypotheses will then be presented, followed by an explanation of the research method which primarily involves the use of Partial Least Squares (PLS) to analyse survey-based data that has been collected from Australian organisations. The final two sections will provide the analysis of the results and a discussion of the findings.

2   LITERATURE AND THEORY

2.1   RBV and organisational capabilities

Organisational resources and capabilities, and how they relate to competitive advantage, are the primary focus of most RBV theory and empirical work (Wernerfelt 1984, Barney 1991, Grant 1991). Despite a robust theory base, RBV has drawn criticisms from some observers due to the differing ways researchers have defined and related the concepts of resources and capabilities. This confusion is considered by some to result in difficulties identifying a clear RBV theory base (Priem and Butler 2001) and theoretical disparities between deriving competitive advantage through resource selection and via building organisational capabilities (Kraaijenbrink et al. 2010). Proponents of RBV theory counter argue that that resources and capabilities are related by necessity, and that these issues do not ostensibly damage the usefulness of RBV theory (Barney 2001).

A capability can be defined as a non-transferable, firm-specific resource which has a purpose of improving other resources possessed by the firm (Makadok 2001). Capabilities generally operate in combinations and are 'built' by the organisation as opposed to being 'bought' (Amit and Schoemaker 1993). Consideration of how capability combinations are built has been identified as a worthwhile academic pursuit (Makadok 2001) and this paper will consider the composition of organisational IT capabilities, comprising of a series of IT-related capabilities and resources (Prasad et al. 2010).

IT governance and IT management capabilities are likely to manifest with organisationally specific characteristics and levels of quality due to variations in employee aptitude and organisational culture, even where similar styles of best practice are followed (Barney 1986, Mata et al. 1995, Sambamurthy and Zmud 1999). In a similar manner, the specific combinations of software, hardware and networking resources used in the provision of IS functionality will also have organisation-specific factors: for example highly customised and in-house developed systems and uniquely designed network infrastructure. IT governance, IT management and IS functionality also hold other characteristics necessary to meet the definition of an RBV capability in that they can be considered to be valuable, and non-substitutable, and their organisational specificity makes it very difficult for competitors to perfectly imitate (Barney et al. 2001, Barney 1991). While IT governance, IT management and IS functionality each qualify as RBV capabilities in their own right; it is the interaction between these capabilities and the combination into an organisational IT capability that may provide sustainable competitive advantage over organisations that lack this capability (Bharadwaj 2000).

Ordinary, or 'zero-level', capabilities are relied upon for day-to-day business operations and are unlikely to be a source of competitive advantage by themselves. Higher level capabilities are used interactively to modify and adjust ordinary capabilities with reference to changing strategic prerogatives (Winter 2003). Dynamic capabilities are a particular class of higher level capability that assist organisations adjust ordinary capabilities in response to technological and competitive pressures (Teece et al. 1997). While some authors have theorised that dynamic capabilities are only of relevance in highly turbulent environments (Eisenhardt and Martin 2000), others have suggested that dynamic capabilities operate at both moderate and high levels of environmental pressure (Pavlou and El Sawy 2011, Winter 2003). While much effort has gone into attempting to clarify the exact nature of dynamic capabilities (Peteraf et al. 2013, Teece 2007, Teece 2014) it is often unclear whether a particular organisational capability 'qualifies' as being dynamic or not.

This paper theorises that the interactions between IT governance, IT management and IS functionality can be viewed as complementary components of an overall organisational level IT capability. The role of IT governance is to monitor, direct and control the activities of IT management (SA 2010) which in turn is responsible for the implementation and maintenance of IS. Therefore IT governance can be envisaged as a higher order capability which acts to align IT management activities with changes in organisational strategy. This paper also considers whether effective combinations of IT governance and IT management capabilities change at varying levels of competitive and technological pressure.

2.2 IT governance

The term IT governance is often used interchangeably with IT management. The conflation between these concepts is unsurprising, as a key objective of both organisational functions is to improve the value received from IT investments. Despite this shared objective, the role and responsibilities of these two functions are quite distinct (Sohal and Fitzpatrick 2002). ISO/IEC: 38500 clearly highlights the differences between the 'hands-off' strategic role of IT governance; which provides direction and control of IT management and investment, and the 'hands-on' active role of IT management; which is responsible for undertaking activities such as the implementation and maintenance of organisational IS.

IT governance can be observed as a collection of structural, procedural and relational mechanisms operating within the organisation (Peterson 2004). Structural mechanisms were a primary focus of early IT governance research (Sambamurthy and Zmud 1999, Weill and Ross 2005). These types of mechanisms generally relate to organisational structure characteristics, such as the delegation of

decision making authority and monitoring and control responsibilities to individuals and committees within the organisation. Procedural mechanisms usually manifest as management protocols designed to assist managers make appropriate IT-related decisions. They include techniques such as formalised strategic IS planning, balanced IT scorecards, chargeback arrangements, and the implementation of the IT governance related frameworks such as COBIT (De Haes and Van Grembergen 2009). Relational mechanisms are often intangible and relate to human interactions. They can be formal or informal and refer to concepts such as leadership, culture, communication and knowledge sharing processes (Ko and Fink 2010, Huang et al. 2010).

The most appropriate design and deployment of IT governance mechanisms is contingent on the unique characteristics and circumstances of each organisation (Sambamurthy and Zmud 1999). This suggests that it may be difficult to identify effective IT governance formatively, basing the assessment on which mechanisms the organisation has in place, without extensive consideration of many other organisational factors. Accordingly this paper focuses on the performance of two critical relational mechanisms from a reflective perspective to identify the presence of effective IT governance: the leadership of the organisation's Chief Information Officer (CIO) (Chun and Mooney 2009), and the culture of IT-business strategic alignment (Kearns and Sabherwal 2006).

Business-oriented CIOs, in contrast to technically focused CIOs, have been found to be of significant value to organisations (Preston et al. 2008, Sobol and Klein 2009) and organisations have demonstrated an increasing preference for CIOs with strong business credentials. This type of CIO is perceived to be more strategically aware, directing IT investment and operations with business goals foremost in mind. Then CIO is in the best position to recommend and implement the series of IT governance mechanisms that best suit organisational characteristics and, in this light, CIO leadership can be considered in the context of a formal relational mechanism (De Haes and Van Grembergen 2009, Chun and Mooney 2009).

A key goal of IT governance is to establish and maintain alignment between business and IT strategies (ISACA 2012). Such alignment requires not only mutual referral and consideration during the establishment of business and IT strategies, but also ensuring that knowledge of strategic risks, opportunities and other relevant business issues is shared between business and IT focused employees (Kearns and Sabherwal 2006). Such alignment encourages business managers to be informed, agile and proactive in relation to the uses of IT/IS; and IT managers to appreciate broader business issues. Strategically aligned organisations are more likely to make effective decisions regarding opportunities and risks, and make better use of available resources (Henderson and Venkatraman 1999, Kearns and Lederer 2000). Strategic alignment can be considered as an informal relational mechanism related to organisational culture (Kearns and Sabherwal 2006, Van Grembergen and De Haes 2009).

2.3   IT management

The cost involved in obtaining and maintaining IS is sometimes considered a necessary evil by business-focused employees. This may be due to the fact that the business value of any individual technology-based resource is often difficult to assess. Some observers have even suggested that IT provides no real opportunity for achieving competitive advantage (Brynjolfsson 1993, Carr 2003). Others have argued that while proprietary technology and technical IT skills are unlikely to be a source of competitive advantage (Mata et al. 1995), the skills applied to the management of these IT-related resources and assets may hold the key to such an advantage (Bharadwaj 2000, Wade and Hulland 2004). Highly effective IT managers not only understand current organisational needs, but also anticipate the future needs of functional managers, suppliers and customers (Ravichandran and Chalermsak 2005). Effective IT management can deliver competitive benefits by identifying useful technology resources and making them available so they can be used to exploit market opportunities. The two most common ways for technology-based resources, such as IS, to be deployed by IT management is through implementation projects (Kearns and Sabherwal 2006), and by adapting and enhancing existing systems via IT support services (Gorla et al. 2010, Pitt et al. 1995).

An organisation possessing a strong IT project capability will have increased rates of project success and receive improved benefits from newly implemented IS (Jugdev et al. 2007). Organisations with an effective IT service capability are able to maximise the benefits received from existing IS, and make necessary adjustments and improvements to those systems in a flexible and efficient manner (Gorla et al. 2010, Jia and Reich 2011). While best practice frameworks and standardised procedures have generally improved IT project and IT service capabilities world-wide; not all organisations are equally apt at implementing best practice (Peteraf et al. 2013), resulting in variance in relative IT project and IT service capabilities between organisations.

2.4 Information Systems and AIS

Information Systems (IS) is a general term that can be used to describe the collection of software, hardware and network technologies utilised to support and control the business processes of an organisation. There are many types of IS that organisations may choose to employ; however almost all organisations will require some form of accounting information system (AIS) to support and control the recording of business event data and processing of accounting information (Nelson et al. 2005, Neely and Cook 2011). This paper defines AIS as the collection of systems and technology that supports the accounting function of an organisation, regardless of whether those systems are standalone or embedded within broader enterprise level systems. The ubiquitous nature of AIS makes it a useful point of reference with which to consider the relationship between IT governance, IT management and IS. Despite the fact that organisations utilise AIS for broadly the same purposes; the brand, structure, quality, complexity and capacity of each technology component in an organisation's AIS are likely to vary considerably. This generally results in complex, organisationally-specific, AIS environments which differ in their respective quality and capacities (Nelson et al. 2005).

The accurate and timely recording and storage of business event data is a core capability of any AIS, and the failure to record and reproduce data accurately will result in confusion and significant operational problems. However organisations seeking to obtain substantial benefits from their AIS will need to go beyond this base AIS capacity, and develop the capability to transform business event data into valuable accounting information. This information is often contained in operational, financial and taxation activity reports, as well as planning, budgeting and forecasting reports (Rom and Rohde 2007).

The accounting information contained in the operational, financial and taxation activity reporting generally has a focus on historic or current events. As such the accounting information contained in these reports is often most useful for short term tactical and operational decision making. Conversely the future-oriented information generated by the planning, budgeting and forecasting components of the AIS is more likely to be useful for long-range strategic decision making purposes (Granlund 2011, Rom and Rohde 2007). As the requirements for these different styles of reporting are often diverse, the exact composition of IS and other IT resources used for current/historical reporting and future-oriented planning, budgeting and forecasting may be quite different; resulting in two AIS capabilities of differing qualities. While both of these capabilities are likely to benefit from effective IT governance and IT management; future-oriented AIS capabilities are more likely to utilise complex IS/IT resources to improve predictive accuracy. This likelihood of higher IS/IT complexity infers that future-oriented AIS capabilities may be more impacted by variance in the effectiveness of IT governance and IT management when compared with historical/current AIS capabilities. Accordingly this research focuses specifically on future-oriented AIS capabilities and their interaction with organisational IT governance and IT management capabilities.

3 HYPOTHESES AND RESEARCH MODEL

3.1 Relationships between constructs

The CIO (or equivalent) is generally the most senior employee with direct interest and individual control over technology and technology management within the organisation. In most cases, a part of the CIO's

leadership role in the organisation is to identify and champion strategically important IT investments and oversee the delivery of major IT projects. CIOs also generally have direct control and influence over IT service capabilities through strategy setting, staff selection and the ability to direct the activities of IT service employees (Preston et al. 2008, Chun and Mooney 2009). A counter-argument to these observations is that IT management outcomes are primarily reliant upon individual employee skills. This would imply that CIO leadership has no significant influence on either IT project or IT service capabilities. Substantially more evidence supports the suggestion that CIO leadership will influence IT management capabilities and accordingly we form hypothesis 1:

> **H1a:** CIO effectiveness positively influences IT project capability

> **H1b:** CIO effectiveness positively influences IT service capability

An organisational culture of strategic alignment between business and IT employees is expected to provide benefits to both business and IT work efforts (Henderson and Venkatraman 1999, Kearns and Sabherwal 2006). Reciprocal alignment between business and IT strategic decision making has been found to lead to competitive advantage through improved IS quality (Segars and Grover 1999, Kearns and Lederer 2000). While previous studies do not appear to have thoroughly tested the direct association between strategic alignment and IT project and service capabilities, we expect to find that organisations reporting higher levels of IT-business strategic alignment will also report increased success in delivering IT projects and improved IT services and thus form hypothesis 2:

> **H2a:** Increased strategic alignment positively influences IT project capability

> **H2b:** Increased strategic alignment positively influences IT service capability

Organisational AIS are complex systems comprising of multiple software packages and hardware environments that are generally updated and modified over time. We expect this to be particularly the case with future-oriented AIS. While each individual software or hardware element will inherently possess a level of "quality" which will affect the overall quality of the AIS environment, the capacity for IT management to select the right elements, implement them successfully, support, maintain and develop these AIS resources will also impact the quality of the AIS environment (Pitt et al. 1995, Gorla et al. 2010, Seddon et al. 2010, Ram et al. 2014). Accordingly we posit hypotheses 3 and 4:

> **H3:** Better IT project capabilities positively influence future-oriented AIS capability

> **H4:** Better IT service capabilities positively influence future-oriented AIS capability

While we hypothesise that both IT project capabilities and IT service capabilities are required to achieve better future-oriented AIS capabilities, the relative influence they will have is not likely to be consistent across all organisational settings (Wade and Hulland 2004). IT project capabilities have the most impact during new implementations and major upgrades, while IT service capabilities provide small, but potentially vital, modifications to AIS functionality on an on-going basis. Organisations operating in low competition environments, or environments where there is little technological change, may be more likely to implement 'off-the-shelf' software and retain this software for long periods of time with little need to change or adjust the software. In this scenario the performance of future-oriented AIS will be strongly linked to the outcomes of the initial implementation projects of each AIS component. Organisations operating in high competition environments, or where there is rapid technology churn, need continual changes and upgrades to existing AIS components to meet or beat competitors' rapidly improving capabilities; therefore targeted IT services that improve existing AIS functionality would have an increasingly important role in allowing these organisations to compete.

These observations suggest that the relative influence of IT project management and IT service management capabilities on future-oriented AIS are contingent upon the level of competitive and technological pressures which the organisation faces from the external environment. An organisation possessing active and strategically aware IT governance capabilities will be able to sense relevant IT-related opportunities and threats from a rapidly changing environment, identify the appropriate organisational response to these issues, and act to coordinate and transform organisational IT capabilities

to exploit the opportunity or protect against the risk (Teece 2007). While the specific changes to IT capabilities will differ depending upon the exact circumstances, organisations reconfiguring IT capabilities in response to increasing dynamism are likely to increase the overall quality of IT support services to address organisational needs. An alternative hypothesis is that environmental dynamism has no significant impact of the relative effects of IT project and IT service capabilities on future-oriented AIS capabilities. This implies that there is no need for IT governance capabilities to react to changes in environmental pressures. We believe the former scenario is more probable and propose hypotheses 5:

H5a: The relative effect of IT project capabilities on future-oriented AIS capabilities will be stronger in low dynamism market conditions

H5b: The relative effect of IT service capabilities on future-oriented AIS capabilities will be stronger in high dynamism market conditions

Hypotheses 1 through 5 have been combined to construct an overall research model (Figure 1) which also represents an overarching organisational IT capability.
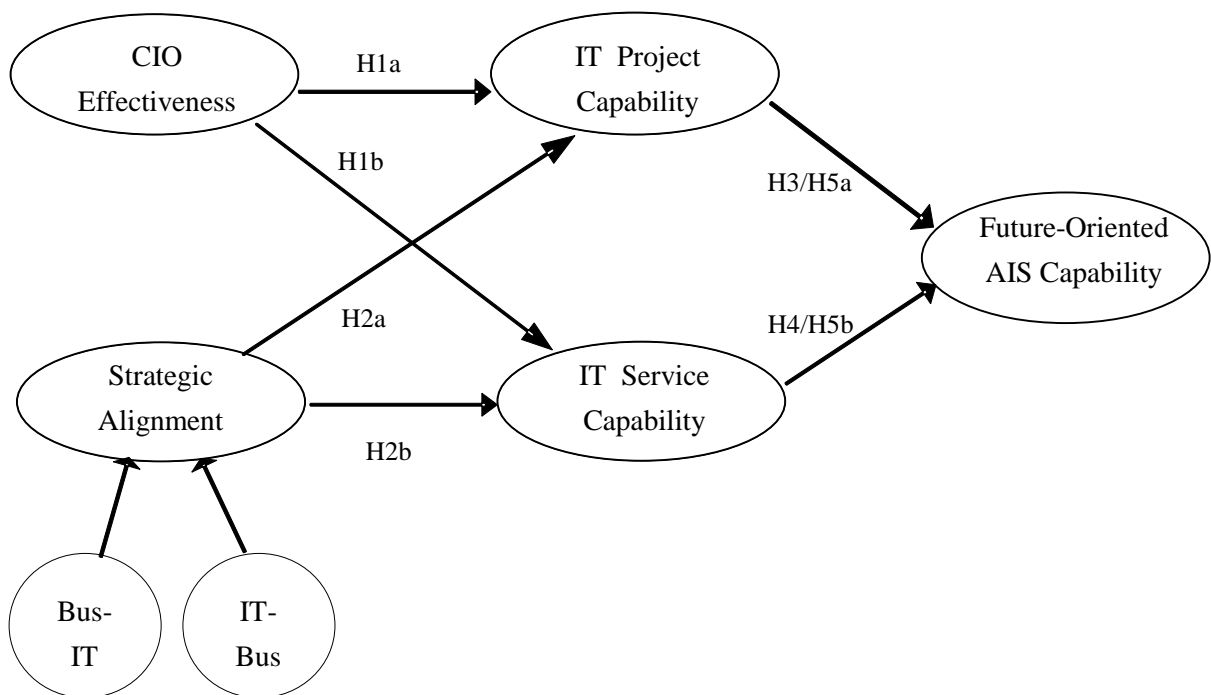

Figure 1.   Research Model

4   RESEARCH METHOD

4.1   Construct Definitions and Measures

Each of the organisational capabilities specified in the hypotheses have been previously considered as intangible latent variables in existing IS and RBV-related research, and this operationalization approach was considered to be the most appropriate for the present research as well. Following the guidance of Molloy et al. (2011) measurement factors from the existing literature were examined with consideration of their validity, reliability and practicality for use in the current research.

This paper takes a knowledge based view of strategic alignment similar to that of Kearns and Sabherwal (2006), and adapt measures from their research to assess strategic alignment. However the present research takes a different measurement approach than these authors by modelling IT to business alignment and business to IT alignment as separate first order latent constructs which combine formatively to measure overall strategic alignment. This was felt to be a more appropriate way to assess

the influence of the two elements of strategic alignment. CIO effectiveness was defined as the extent to which the CIO is perceived as an effective strategic leader (Smaltz et al. 2006) and measures for CIO effectiveness were adapted from Preston et al. (2008) as these closely aligned with this definition. An organisation with a strong IT project capability will deliver successful IT projects more often than those without (Jugdev et al. 2007), accordingly IT project success measures were used for this construct adapting measures from Kearns and Sabherwal (2006). SERVPERF style measures (Kettinger and Lee 1997) were used to assess IT service quality, an approach common in IS success research (Prybutok et al. 2008, Gorla et al. 2010). Noting the importance of tailoring measures to reflect the specific type of IS being assessed (Petter et al. 2008, Guimaraes et al. 2009), the measures applied in prior research by Peters and Wieder (2013) were felt to be the most appropriate to assess future-oriented AIS capability. Environmental dynamism relates to external technological and competitive pressures and measures for this were adapted from Pavlou and El Sawy (2011). Appendix 1 lists the statements used to derive measures of the constructs under examination.

4.2   Data collection and quality

Data for the latent variables under study could be collected via case study or a series of directed interviews; however we determined that an anonymous questionnaire would be the most appropriate method as it enabled us to collect data from a large number of organisations, ensured the data collection procedure was identical for all respondents, and reduced the potential for positively biased answers due to organisational reputation concerns. The ideal respondent would need to be a user of AIS, particularly of strategic planning functionality; however should not have any direct responsibility for organisational IT so as to reduce potential for self-reporting bias. The ideal respondent would also have sufficient seniority so as to be aware of organisational IT issues from a strategic perspective. Potential respondents would also need to be selected from sufficiently large organisations so there would be a reasonable expectation of some complexity being present within their AIS infrastructure.

Contact data for senior managers and executives in positions of financial responsibility (CFO, VP Finance, etc.) employed at Australian organisations employing more than 50 people and generating more than $30 million AUD in annual revenue was purchased from a marketing database provider. Following verification and exclusion of unsuitable contacts, a total of 1006 potential survey respondents were identified. These potential respondents were sent an email request, informing them of the research and asking them to complete an Internet-based questionnaire. Two reminder emails were also sent to potential respondents over the course of several weeks. A dual Internet-based and paper-based method was not used primarily for cost and efficiency reasons; however a single delivery method also reduces the potential for miscoding, and responses completed via Internet-based methods have been found to be of the same quality as those completed on paper (Grandcolas et al. 2003).

The number of survey recipients was revised to 823 due to undeliverable emails. A total of 222 responses were received providing an initial response rate of 27%. To improve the reliability and validity of the data set, responses were excluded from further analysis where the respondent did not answer all questions, did not provide an suitable position title, indicated that they had worked in the organisation for 1 year or less, were employed by an organisation that was described as a supplier/provider of IS, or were employed by organisations with less than 50 employees and/or with less than $30 million AUD in revenue – although not all respondents provided revenue data. The application used to deliver the questionnaire recorded the completion time for each respondent. Using this information, responses that were completed very quickly (compared with the average time to complete of 8 minutes) were also excluded. 185 completed responses remained resulting in an effective response rate of 22.5%.

Responding organisations had a median of $180 million AUD revenue and 600 employees; however there were several responses from very large organisations well above the median organisational size. Despite these outliers the composition of each latent construct and the overall analysis results were found to be unaffected when organisational size factors were added as control variables. Table 1 below displays the size statistics of the participating organisations.

Size Category	Min	1st Quartile	Median	3rd Quartile	Max
Revenue (AUD millions)	0	70	180	500	60000
Revenue (excluding non-reports)	30	99	213	724	60000
Employees	50	240	600	1750	30000

Table 1.   *Size characteristics of the responding organisations*

Using the early-late response test for non-response bias (Armstrong and Overton 1977) the sample was split into two groups; the 105 responses received between the first and second survey notifications, and the 80 responses received after the second and third notifications. We found no significant differences between the latent construct scores generated for early and late respondents.

While it is essentially impossible to rule out common method bias in survey-based research, procedural design based remedies advocated by Podsakoff et al. (2003) were applied where appropriate. This method was preferred to statistical validation methods, e.g. marker variables (Lindell and Whitney 2001), which can be limited in reliability (Podsakoff et al. 2003, Sharma et al. 2009)[1].

4.3   Construct reliability and validity

The PLS regression analysis determines indicator loadings for each latent construct which reflect the correlations between each indicator and the construct to which it is assigned. Indicators that have a loading of 0.7 or more are generally acceptable when dealing with reflective constructs. A loading factor of this level demonstrates that most of the variance observed in the indicator is explained by the latent construct. It is often appropriate to retain indicators that fall just below the 0.7 threshold as long as there is a theoretical justification for their retention (Hulland 1999). Almost all indicators had a loading factor of 0.7 or higher and no indicator has a loading value of less than 0.64 on their allocated construct. The indicators that reported a value of less than 0.7 were reviewed for theoretical relevance and retained. Table 2 demonstrates that composite reliability statistics for each reflective construct are higher than 0.70 as recommended by Hair et al. (2011). It should be noted that the Cronbach Alpha scores for the constructs are also acceptable.

Construct	AVE	Composite Reliability	Cronbach's Alpha
CIO	0.610	0.886	0.844
Strategic Alignment	0.453	0.867	0.825
IT Project Capability	0.679	0.913	0.882
IT Service Capability	0.640	0.899	0.860
Future-Oriented AIS Capability	0.550	0.879	0.835

Table 2.   *Construct Reliability*

A comparison of the AVE of the reflective constructs with the highest squared Spearman's Rho correlation with all other constructs identified that the constructs possess sufficient convergent and discriminant validity as recommended by Hair et al. (2011) and Fornell and Larcker (1981).

Formative constructs are substantially different to reflective constructs in both theoretical and statistical points of view. Because the indicators of formative constructs generally do not have theoretical or actual correlation, it is not possible to utilise a correlation based analysis to determine the validity of a formative construct (Petter et al. 2007). The validity of choosing a reflective-formative multi-level construct to measure strategic alignment is primarily assessed on theoretical considerations and the resulting beta scores of the construct measures.

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[1] A Hartman's one-factor test was run indicating that no single factor that explained the majority of variance in the results.

5 RESULTS

The path model was assessed using PLS (Smart PLS Version 2.0) and bootstrapping analysis. PLS was preferred over a standard structural equation modelling technique due to the relatively small sample size (Shackman 2013) and the inclusion of strategic alignment as a 2nd order formative construct (Rodgers and Guiral 2011). The percentile bootstrap method (Bollen and Stine 1990) was used for calculation of path coefficients and significance testing. In order to test hypotheses 1 through 4, a PLS regression was undertaken on the path model utilising the full set of 185 responses. To test hypotheses 5, the data set was split into a high (92) and low dynamism groups (93) based on the sum of each respondent's answers to the six dynamism measures. The sub-samples were compared using PLS and non-parametric permutation tests (Qureshi and Compeau 2009, Chin and Dibbern 2010).

5.1 Full sample results

Figure 2 provides a summary of the PLS analysis of the full sample[2]. The path coefficients for CIO effectiveness and strategic alignment culture indicate that both of these factors strongly influence IT project and IT service capability as hypothesised (H1 and H2), with CIO effectiveness being slightly more influential than strategic alignment culture. The results also support hypotheses 3 and 4.
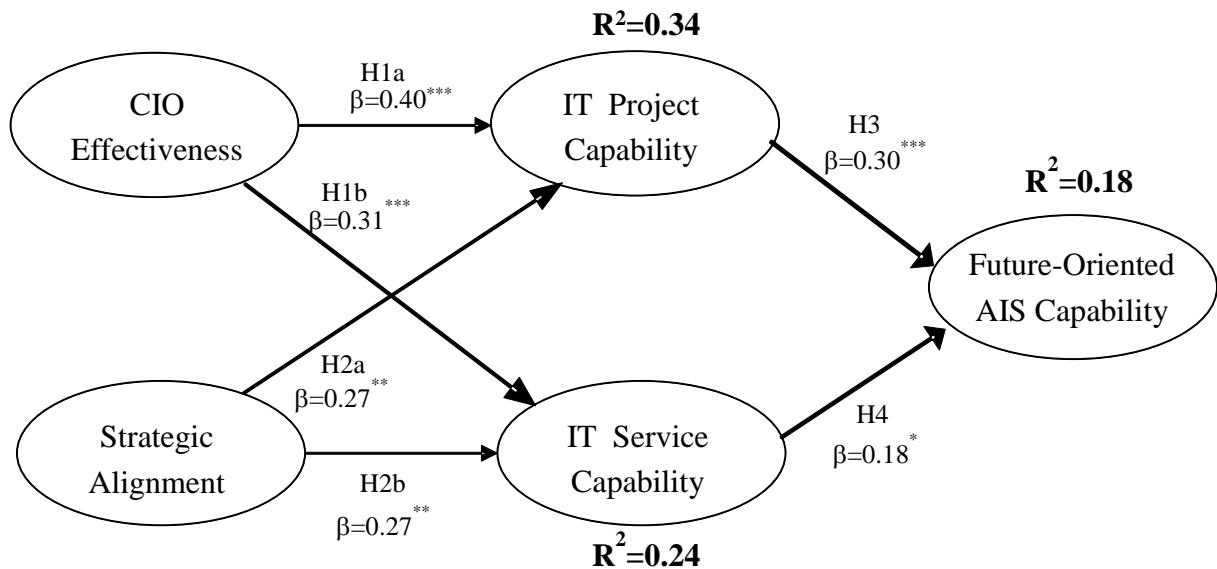
Figure 2. Full Sample Structural Model Results (one-sided p values ***=p<0.1, **=p<1.0, *=p<5.0)

5.2 High and low dynamism sub-sample results

The comparative results of the split sample analysis (summarised in Figure 3) demonstrate a substantial divergence between organisations operating in high and low dynamism environments. IT service capability had a strong influence ($\beta=0.33$, $p < 1.0$) on future-oriented AIS capability in highly dynamic environments; whereas IT project capability had a weaker, but still significant, effect ($\beta=0.21$, $p < 5.0$). Conversely in low dynamism environments the relative influences of IT project capability and IT service capability are essentially reversed. IT project capability has a much stronger influence ($\beta=0.37$, $p < 1.0$) and IT service capability has little, if any, effect ($\beta=0.03$, $p > 5.0$). Additionally, the IT governance constructs had less influence on IT service in the low dynamism sample and the structural model explained less variance within each IT capability construct for this sub-sample as well.

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[2] Comprehensive tabular results are available but have not been included due to submission page limit

A non-parametric permutations test identified a significant ($p < 0.5$) difference in the path coefficient for IT service capability and future-focused AIS capability when comparing the high and low dynamism sub-samples; however the difference in the path coefficients for IT project capability and future-focused AIS capability was not found to be significant. On this basis the analysis fully supports Hypothesis 5b (stronger and statistically significant) but only partially supports Hypothesis 5a (stronger but not statistically significant).
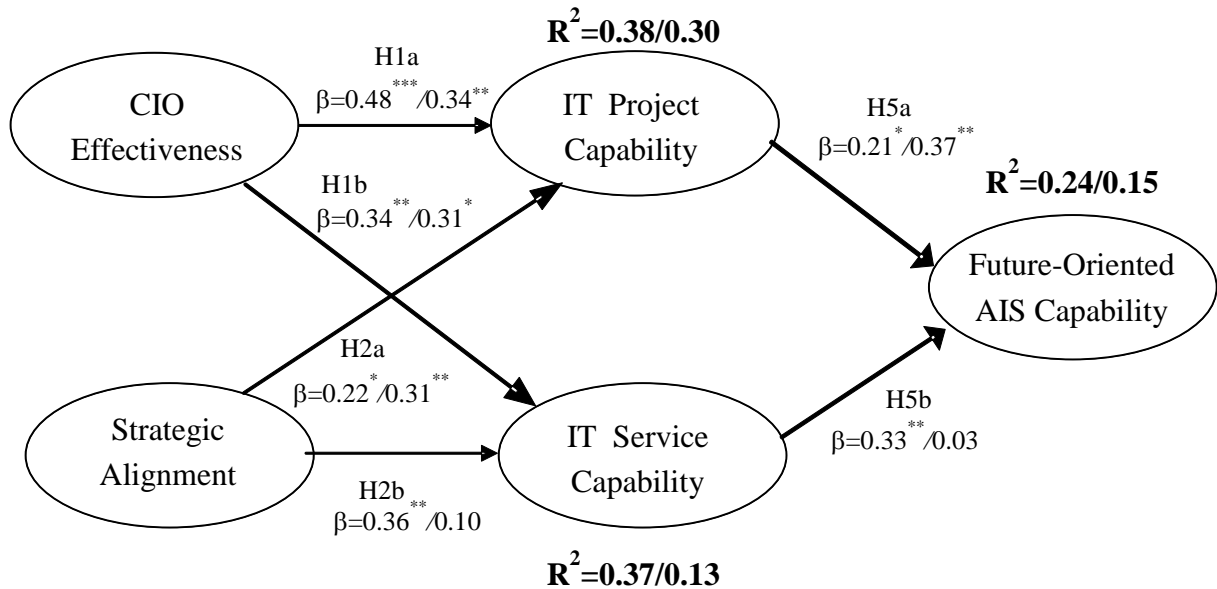

$R^2=0.38/0.30$

H1a
$\beta=0.48^{***}/0.34^{**}$

$R^2=0.24/0.15$

H1b
$\beta=0.34^{**}/0.31^{*}$

H5a
$\beta=0.21^{*}/0.37^{**}$

H2a
$\beta=0.22^{*}/0.31^{**}$

H5b
$\beta=0.33^{**}/0.03$

H2b
$\beta=0.36^{**}/0.10$

$R^2=0.37/0.13$

Figure 3. Model results in high/low dynamism (one-sided p values ***=p<0.1, **=p<1.0, *=p<5.0)

6 DISCUSSION AND CONCLUSIONS

6.1 The impact of IT governance on IT management and information system capabilities

The results of the path model analysis illustrate the impact of effective IT governance capabilities and how they combine with IT management capabilities to form an organisational level IT capability. This capability can significantly affect the performance of organisational IS, as has been demonstrated in this present research with regards to future-oriented AIS. An organisation with a superior future-oriented AIS capability will have access to high quality planning, budgeting and forecasting accounting information (Rom and Rohde 2007) which improves strategic and tactical decision-making, thus increasing the chances of achieving competitive advantage (Neely and Cook 2011).

While this study examined the impact of IT governance and IT management capabilities on future-oriented AIS, these capabilities should provide similar performance outcomes in relation to other types of enterprise level IS, including supply chain management (SCM) systems, customer relationship management (CRM) system or complex e-business systems. It is through the interaction between IT capabilities and a variety of organisational IS that a strong organisational level IT capability may provide competitive advantage for an organisation over an extended period of time (Bharadwaj 2000).

6.2 IT governance and market turbulence (dynamism)

The results indicate that the relative influence IT service capability has on future-oriented AIS capability is contingent on the strength of competitive and technological pressures experienced by the organisation. This highlights the importance of establishing and maintaining high quality IT service capabilities in organisations operating in high dynamism environments. The results also identify that the overall influence of IT governance and IT management capabilities on future-focused AIS quality is generally higher in turbulent environments. While these findings may imply a simplistic arrangement where

investment and focus on IT capabilities should increase to match comparable increases in competitive and technological pressures; organisations cannot simply buy these capabilities when needed. Instead, those responsible for IT governance should work towards establishing flexible IT management and IS capabilities that can be quickly modified in response to changing strategic imperatives. This presents a scenario where IT governance can act as a higher order capability, arranging changes in IT managerial and IS-related capabilities to exploit or defend against market opportunities and risks (Teece 2014). Unfortunately the data analysed does not possess sufficient detail to conclusively determine whether IT governance acts as a dynamic capability as defined in the RBV literature (Teece 2007, Peteraf et al. 2013) and this issue will require further consideration in future research.

6.3 Implications for Practitioners

The findings of this paper highlight the importance of establishing and maintaining effective IT governance and IT management capabilities for IS performance. Organisations benefit from employing highly effective CIOs through improved IT project success rates and IT service quality. These benefits were consistently achieved at both high and low levels of environmental turbulence. The findings also suggest that senior executives and the board should actively encourage both business and IT focused managers to develop and maintain sufficient knowledge of the other's domain, particularly in regards to strategic opportunities and threats. Such strategic alignment increases the chances of IT project success as the organisation will select technology and systems that better match business requirements, and implementation projects will be aided by the presence of end users with knowledge and interest in the technology being implemented. In highly turbulent environments strategic alignment is vital for achieving high quality IT service, as both IT and business focused managers will be more capable of identifying strategically important updates and changes to IS.

Perhaps most importantly, the findings also highlight that the managers and executives responsible for IT governance should take active steps to identify changes in environmental pressures and consider how they can respond to these changes through adjusting the organisation's IT capabilities. This is often not as easy as simply employing new staff or buying new software – significant thought, forward planning and environmental awareness will be necessary to facilitate such changes. While this paper has not examined other IS specifically, it is probable that other types of organisational IS will benefit from active and effective IT governance in a similar manner as future-oriented AIS.

6.4 Limitations and Future Research

Despite a reasonably good response rate, the overall number of responses was not substantial enough to allow detailed analysis at an industry sector level. It seems likely that organisations in certain industry sectors would have very different requirements of their AIS than others, for example AIS usage in the financial sector would be quite different to that in the mining sector. While substantial effort was put into reducing the impact of common method bias during methodology design, it remains essentially impossible to remove the potential for this form of bias, or even satisfactorily prove via statistical methods that common method bias is not a significant issue.

Single point of time data does not provide sufficient insight into whether IT governance truly acts as a dynamic capability by modifying and adjusting the IT management function and IS capabilities. Future research could examine this issue over a period of time in a research setting where organisations experience high levels of environmental dynamism. This setting would also provide further insight into the relationships between IT governance, IT management and IS.

This study focused on IT governance and IT management performance from a reflective perspective, utilising subjective measures which may hold an inherent bias. Accordingly it would be informative to determine whether specific IT governance and IT management inputs, such as those identified by De Haes and Van Grembergen (2009), provide similar results to the reflective mechanisms and outputs considered in this study.

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Appendix 1 – Construct Indicators from Survey

Measure	Statement	Adapted from
BUS-IT SA	Business managers consider IT to be of strategic value	Kearns & Sabherwal (1996)
	Business managers are aware of the organisation's IT assets	
	Managers from a variety of business functions are engaged in the IT planning process	
	IT planning involves an evaluation of future information needs of business managers	
IT-BUS SA	IT managers (IT specialists) regularly attend business strategy meetings	
	IT managers (IT specialists) participate in setting business goals and strategies	
	IT managers (IT specialists) participate in the early stages of major business projects	
	Business strategies set by the organisation address IT-related opportunities and threats	
CIO	The CIO (or equivalent) has responsibility for the strategic direction of IT	Preston et al. (2008)
	The CIO (or equivalent) has the authority to determine which IT initiatives should be pursued	
	The CIO (or equivalent) is an effective strategic leader	
	The CIO (or equivalent) is better described as a business focused executive as opposed to a technical expert	
	I have confidence in the performance of the CIO (or equivalent)	
IT Project Capability	Significant IT projects always succeed in achieving their intended scope	Kearns & Sabherwal (1996)
	Significant IT projects always stay within budget	
	Significant IT projects are always completed on schedule	
	Significant IT projects always produce high quality results	
	Significant IT projects always succeed in meeting business requirements	
IT Service Capability	The IT support function is responsive to technical problems	Gorla et al. (2010)
	The IT support function meets promised deadlines	
	The IT support function is able to resolve problems on the first attempt	
	The IT support function communicates important information to IT users	
	The IT support function understands the needs of IT users	
Future-Oriented AIS	Data is shared effectively between the various planning, budgeting and forecasting systems	Peters and Wieder (2013)
	It is easy to modify or adapt forecasts and budgets in response to changing business requirements or new information	
	The planning, forecasting and budgeting systems meet our current business requirements	
	The planning, forecasting and budgeting systems support the planning of a wide range of performance indicators	
	The planning, forecasting and budgeting systems provide the ability to forecast multiple scenarios	
	The planning, forecasting and budgeting systems support multidimensional planning (e.g. by product line, region, distribution channel, etc)	
Environmental Dynamism	The technology in our industry is changing rapidly	Pavlou & El Sawy (2011)
	In our kind of business, customers' preferences change quite a bit over time.	
	It is very difficult to predict who might be our future competitors	
	One hears of a new competitive move almost every day	
	It is difficult to predict customer preference changes in our marketplace	
	It is very difficult to forecast where the technology in our industry will be in the next 2 to 3 years.	

Table 3.   Construct Indicator Statements from Survey