IT INVESTMENT GOVERNANCE: WHAT IS IT AND DOES IT MATTER?

ABSTRACT

While the growth in the number of IT investments remains strong, research in the IT investment field is limited, resulting in suboptimal practical guidance on effectively governing IT investments. Based on resource-based theory, this paper reports the initial work involved in developing a construct named IT investment governance (ITIG), because it can be used to measure organizations' capability to govern their IT investments. This paper then empirically examines the association of ITIG and corporate performance. Adopting the rigorous method used to derive this measure, the preliminary result is a four-factor, 16-item instrument for assessing the ITIG construct. This method's factors are IT investment value governance, IT investment value monitoring, IT investment appraisals and IT investment project management. The impact of ITIG on corporate performance was demonstrated with a significant and positive relationship found to exist between the ITIG construct and corporate performance, thus supporting the effectiveness of the ITIG construct. Corporations with higher levels of ITIG capability are more likely to maximize the contribution of their IT investments to firm value.

Keywords: organizational capability, resource-based theory, scale development, exploratory factor analysis, IT Investments Governance, top-level management, corporate performance, Australia.

1. Introduction

Expenditure on IT can represent a significant investment in corporate resources for businesses because it can increase their expectations of the value of IT (Kappelman et al, 2014). Recently, Gartner (2015) reported that worldwide IT spending totalled $3.8 trillion in 2015, up 2.4 percent from 2014 spending. At an organizational level, IT investment was higher than 50 percent of capital spending of many firms (Nolan and McFarlan, 2005). A survey by the Society for Information Management found that, in 2014, corporations allocated on average 5.1 percent of revenues to their IT budgets (Kappelman et. al., 2014). Despite the growing amount of IT investment in organizations, there appear to be few recently validated measures to guide organizations on how to govern IT investments effectively (Sherer, 2007; Peppard et al., 2007; Maes et al., 2012; Bulchand-Gidumal & Melián-Gonzales, 2011; Schryen, 2013).

IT investment governance (ITIG) which is a subset of IT governance is mainly concerned with the aspects of value delivery and resource management of IT within organizations (Weill & Ross, 2004; ITGI, 2008). Weill & Ross (2004), note that IT governance encompasses five sub-domains: IT principles; IT architecture; IT infrastructure; business application needs; and value delivery and resource management. Building on the prior literature, this study focuses on the IT investment aspect of IT governance (i.e., resource management and value delivery). In this study, value is defined as "the impact of investments in particular IS assets on the multidimensional performance and capabilities of economic entities at various levels, complemented by the ultimate meaning of performance in the economic environment" (Schryen, 2013, p. 141). IT investments require proper governance, as improper governance of IT investments may jeopardize the level of IT's contribution to the overall business value achieved (e.g., Bajaj, et al., 2008; Sherer et al., 2002; Peppard, 2007; Kumar et al., 2008; Jeffrey & Leliveld, 2004). Prior studies propose areas that need to be governed effectively. For example, Weill and Ross (2004) propose three main concerns in IT investment: (1) how much to spend, (2) what to spend it on, and (3) how to reconcile the needs of different constituencies. Prior to that, Bacon (1992) highlighted similar concerns for IT investments by proposing these questions: "How do organizations decide on their information systems and technology (IST) investments, and how should they decide?" (p. 337). Such concerns need to be addressed effectively to ensure IT investments contribute to firm performance. Thus, in this context, ITIG is important.

This paper proposes ITIG as an organizational capability that can play important roles in explaining the link between IT investments and corporate performance. Using resource-based theory as its theoretical foundation, this paper posits that ITIG is an organizational capability that helps organizations realize optimal benefits from their IT investments. In this paper, organizational capability refers to how an organization performs "a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving particular end results." (Helfat and Peteraf, 2003, p. 999). In this paper, the organization itself is represented by its board of directors and its top management team members. Boards of directors and top management should engage in decision making and monitoring of IT investments within their organizations to ensure that the IT investments deliver real value to them (Weill & Ross, 2004; Nolan & McFarlan, 2005; Peppard et al., 2007; Mithas et al., 2011). ITIG as an

organizational capability, can provide sustained advantages for corporations as ITIG can provide a valuable, rare, inimitable and non-substitutable (VRIN) resource (Barney, 1991). This accords with Bharadwaj's (2000) view that how a firm leverages its investments to create unique IT resources and skills is what determines its overall effectiveness because [IT] investments *per se* do not provide any sustained advantages.

To perform their functions properly, the boards of directors and top management need research-based guidance to help them obtain and optimize the value of IT investments (ITGI, 2008). Van Grembergen and De Haes (2008a), however, reveal that ITIG practices are difficult to realize. According to ITIG (2008), this situation is due to limited access to a structured approach to ITIG. Nolan and McFarlan (2005) report in a survey by Deloitte Consulting on boards of directors and top level management that, of the 35 organizations surveyed, only one respondent reported the use of a comprehensive approach to measuring and managing IT investments. Deloitte Consulting reported similar findings, whereby they found only 13 percent of the respondents monitor and measure the value of their IT investments (Corporate Board Member, 2007). Furthermore, ITGI (2008, p. 12) report that "a comprehensive, proven, practice-based structured governance framework—that can provide boards and executive management teams with practical guidance in making IT investment decisions and using IT to create enterprise value" was needed.

The development of an appropriate research-based instrument to guide and measure ITIG dimensions effectively is important in guiding boards of directors and top-level management when governing their IT investments. So that is the purpose of this paper: to use resource-based theory to empirically examine the association between ITIG as an organizational capability and corporate performance.

The remainder of the paper is organized as follows. Section 2 provides further background on the literature that helps describe both resource-based theory in the IT research context and thus the ITIG construct. Section 2 also includes the literature that helped form the initial dimensions and items for ITIG. Section 3 discusses the construct development method by detailing the three stages in the construct development (i.e., domain specification, instrument development, and measurement properties). Section 3 also demonstrates the empirical validation of the construct. Section 4 presents evidence of the potential impact of ITIG by examining its influence on the overall level of corporate performance. This work is followed by a discussion of the conclusions, limitations and future studies (Section 5).

2. Background

In this section, we focus on the literature that helps describe resource-based theory in the IT research context, as well as the ITIG construct.

2.1 Resource-based theory in IT research

Resource-based theory is one of the most prominent and widely used theories for understanding the source of sustained competitive advantage for organizations (Barney et al., 2011). The theory maintains that, for organizations to achieve sustained competitive advantage, they must have resources that fulfil four criteria. The resources must be valuable,

rare, and difficult to imitate, as well as having no equivalent substitutes (Barney, 1991). Furthermore, Barney (1991) categorizes the resources into three groups: physical capital resources, human capital resources, and organizational capital resources. Physical capital resources cover IT infrastructure within an organization, plant and equipment, and geographic location. Human capital resources cover individual managements' experience, judgment, intelligence and insight. However, organizational resources cover an organization's "formal reporting structure, its formal and informal planning, controlling, and coordinating systems, as well as informal relations among groups within a firm and between a firm and those in its environment" (Barney, 1991, p. 101).

Because resource-based theory can explain the source of organizations' sustained competitive advantage and is widely used in strategic management discipline, it has also been used by IT researchers in multiple research areas of information systems (IS) (Seddon, 2014). Seddon (2014) highlights some examples of IS research that use resource-based theory, for example, in understanding the impact of IT capability on firm performance (Bharadwaj, 2000), in examining IT-enabled business processes (Melville et al., 2004), in understanding the relationships between IT assets, organizational IT capabilities and business strategy (Aral & Weill, 2007; Nevo & Wade, 2010), and in understanding effective project management (Tarafdar & Gordon, 2007).

This paper adopts resource-based theory in which ITIG is said to involve both human and organizational capital resources (Barney, 1991). ITIG provides the means by which organizations can govern their IT investments and thus help ensure optimal benefits for themselves. Effective ITIG requires boards of directors and top management team members to actively participate in managing and governing their IT investments. This involvement requires skills and knowledge which evolve and accumulate over time and are thus more likely to be tacit and highly local or organization-specific (Bharadwaj, 2000; Sambamurthy & Zmud, 1997). Bharadwaj (2000, p. 174) further states that "viewed from a resource-based perspective, it is clear that human IT resources are difficult to acquire and complex to imitate, thereby serving as sources of competitive advantage. In fact, the wide difference in competitive organizational and economic benefits that companies gain from IT has been attributed largely to their managerial IT resources." Therefore, using a resource-based theory perspective, ITIG can be viewed as representing human and organizational capital resources that are valuable, rare, hard to imitate, and non-substitutable when organizations govern their IT investments.

2.2 ITIG

This paper differentiates IT investment governance from IT investment management. ITIG lies within the responsibilities of boards of directors including top management team members, whereas managing IT investment is mainly the responsibility of the management hierarchy. In line with the discussion, Weill & Ross (2004, p. 8) argue that "governance determines who makes the decisions. Management is the process of making and implementing the decisions. For example, governance determines who holds the decision rights for how much the enterprise invests in IT. Management determines the actual amount of money

invested in a given year and the areas in which the money is invested." Furthermore, Sherer (2007, p. 44) argues that "many of the IT management choices are driven by IT governance [and] the patterns of authority for key IT activities in business firms…Governance involves authority, control, accountability, roles, and responsibilities. IT goes beyond structure and organization to include processes and human relationships including communication, liaisons, shared risks, responsibilities, rewards/penalties, and steering committees." Based on the foregoing, we conclude that "IT investment governance" is substantially more strategic and important for organizations seeking to obtain value from IT than "IT investment management." Peppard (2007, p. 344) contends that organizations should not concentrate solely on "IT management" by saying: "more philosophically, the discourse in this paper challenges the very use of the phrase 'IT management' suggesting that it is inappropriate for the objectives being sought from IT. Organizations should not look to 'manage IT', as managing IT directly—assuming that it can be—is unlikely to achieve much. Rather, more appropriate language is required that closer captures the challenge of generating value through IT."

Val-IT 2.0 (ITGI, 2008, p. 9) defines ITIG as: "Val-IT integrates a set of practical and proven governance principles, processes, practices and supporting guidelines that help boards, executive management teams, and other enterprise leaders optimize the realization of value from IT investments". This definition was formed by, and is consistent with, the literature on IT investment which acknowledges the importance of governance to ensuring IT investments' contribution to firms' performance by proposing certain structures and processes. They comprise: IT value governance (Weill & Olson, 1989; Bajaj, et al., 2008), decision making and evaluation structure (Sherer et al., 2002; Peppard, 2007); IT investment portfolio (Weill & Aral, 2005; Kumar et al., 2008), IT risk management (Bowen et al., 2007; Kumar et al., 2008), pre-implementation evaluation (Bacon, 1992; Tallon et al., 2000; Langdon, 2006), post-implementation evaluation (Tallon et al., 2000; Sherer, et al., 2002), and IT project management (Farbey et al., 1992; Jeffrey & Leliveld, 2004).

Weill and Olson (1989) suggest organizations adopt an IT investment portfolio approach when managing their IT investment projects to align the IT investment initiatives with the business strategy and to initiate and involve senior management in tracking large investments in IT. Lentz et al. (2002) highlight the importance of IT steering committees to monitor IT investment progress and guide implementation processes. They argue that IT steering committees help to monitor implementation, track costs and benefits, and ensure that IT investments deliver their proposed value. To be effective, they report that IT steering committees should involve senior management within organizations. Similarly, Sherer et al. (2002) suggest that organizations should establish IT investment committees to work with IT steering committees to collect and analyse information on the impact of IT investments on business processes. This arrangement may help organizations to prioritize their IT investment decisions.

Tallon et al. (2000) note the importance of pre- and post-implementation appraisals of IT investments by top management. Prior to that study, Kumar (1990, pp. 203-204) reports the importance of having post-implementation reviews of IT investments. Such reviews could cover the "improvement of systems development practices; decisions to adopt, modify, or discard information systems; and evaluation and training of personnel responsible for systems development…ensured compliance with user objectives, improvements in the effectiveness and productivity of the design, and realization of cost savings by modifying systems through evaluation, before, rather than after, a real operation…makes the computer-based information system 'concrete' for managers and users so that they can recognize, if and how, the existing information systems need to be modified."

Furthermore, other IS researchers also suggest other structures and processes in ITIG such as investigating the feasibility of replacement options toward the end of the IT project life-cycle (Farbey et al., 1992), establishing change management which should involve top management using effective communication (Sherer et al., 2002), implementing formal risk resolution via project reviews (Sherer, 2007), and setting up a project board led by senior management (Peters, 1990). Most of the prior studies, however, examine governance's role using partial perspectives and do not try to provide empirically validated, research-based practical guidance on how to govern IT investments. This study attempts to address this shortcoming.

Currently, several frameworks for IT investment governance exist in practice, for example, Val-IT 2.0, IT Investment Management, and IT Business Value (ITBV) (GAO, 2004; ITGI, 2008; Hackett, 2009). However, because these frameworks were developed by business and public sector committees without empirical validation of their respective, final frameworks, dimensions, and measures (see Appendix 1), they tend to lack empirically derived measures. Accepting that IT and the business value it provides have grown more sophisticated and critical to good governance means acknowledging that such growth also comes with a critical strategic risk to corporate governance. Therefore, exploring existing, and perhaps developing new measures for evaluating ITIG are also needed. This paper, therefore, builds on Val-IT 2.0 by introducing an empirically tested measure and its associated framework.

3. Construct Development Methodology

Based on the development approaches used in Lewis et al. (2005) and Churchill (1979), three stages of construct development were used in this study. The three stages are (I) domain specification, (II) instrument development, and (III) measurement properties (see Figure 1).

(INSERT FIGURE 1 HERE)

3.1. Stage I: Domain Specification

To define the ITIG construct, content analysis was conducted using the IT investment literature. Content analysis is a common technique in social sciences for addressing domain specification by drawing inferences from text sources (Templeton et al., 2002; Lewis et al. 2005). This study used the ProQuest Direct database to search for articles and books concerned with IT investments, using the search terms: *IT investments*, *IT investment governance*, and *IT investment management*. Maurer et al. (2006, p. 1061) state that the ProQuest database is a "current and extensively indexed archive on the Internet with approximately 4.5 billion pages, books and journals". Prior IS studies have similarly used this database (e.g., Templeton et al., 2002; Lehmann & Gallupe, 2005; Harman & Koohang, 2006; Allen, 2010). Following Templeton et al's (2002) approach, articles and books were chosen if those phrases were found in the title, keywords, or abstract. Reference lists from the selected literature were also explored for further important sources.

3.1.1. ITIG definition

The content analysis indicated that there had been few advances in the literature (ITGI, 2008; Sherer, 2007; Van Over, 2009). Based on the benefit realization approach framework proposed by Thorp (2003), ITGI adopted and modified the framework into the Val-IT 2.0 framework (ITGI, 2008). Using the definition (recall Page 5) provided in Val-IT 2.0 with

ITIG as its basis, this study relies on relevant research, the development of the measures, and the evolution of the research instrument to define ITIG for this paper as follows: *The set of structures, processes and relational mechanisms within an organization exercised by the board, executive management and IT management to control both the decision-making, and the monitoring of the performance of IT investments*. This definition also reflects the intentions of Van Grembergen (2002) and De Haes and Van Grembergen (2004).

ITIG is a sub-set of IT governance which, in turn, is a sub-system of corporate governance (Weill & Ross, 2004; Van Grembergen et al., 2004; Robinson, 2005). Accordingly, this paper's adapted ITIG definition aligns with both the IT governance and the corporate governance definitions (see Table 1).

(INSERT TABLE 1 HERE)

3.1.2. ITIG domains

Lewis et al. (2005) note that once the conceptual definition of a construct of interest has been defined, it should be followed by a master list of item statements classified by sub-construct dimensions. The item statements are the basis of the research instrument, which is the focus of Stage II.

Using the limited literature on such item statements (ITGI, 2008; GAO, 2004, Lentz et al., 2002; Sherer, 2007; Van Over, 2009), this study adopted and enhanced the three sub-constructs of Val-IT (i.e., value governance, IT investment management, and IT investment portfolio management) (ITGI, 2008). ITGI (2008) states that IT investment value governance's objective is "to ensure that value management practices are embedded in the enterprise, enabling it to secure optimal value from its IT-enabled investments throughout their full economic life cycle" (p. 12); IT investment management's objective is "to ensure that the enterprise's individual IT-enabled investments contribute to optimal value (p. 12); whereas IT investment portfolio management's objective is "to ensure that an enterprise secures optimal value across its portfolio of IT-enabled investments" (p. 12).

The content analysis used in this study supports the three sub-constructs of ITIG and also extends the constructs by uncovering additional important activities related to ITIG. Multiple prior studies in ITIG were used to identify criteria for the three sub-constructs (Lentz et al., 2002; GAO, 2004; Sherer, 2007; ITGI, 2008; Van Over, 2009). Following Templeton (2002), 10 criteria were identified from the prior literature. These criteria were then used to elicit multiple item stems. These item stems were derived from the literature presented in Appendix 2. Table 2, below, presents ITIG's sub-constructs, criteria, and item stems for this study.

(INSERT TABLE 2 HERE)

3.2. Stage II: Instrument Development

In Stage II, each item stem (see Table 2) was converted into an item on the research instrument using a 7-point Likert-type scale (ranging from 1 = 'Not at all' to 7 = 'To a great extent'). This study chose such a scale to suit the perceptual items used for the ITIG construct. Most studies in social sciences, including the IS domain, use a 7-point Likert-type scale as it maximizes both information retrieval from respondents and measurement reliability (Preston & Colman, 2000; Lozano et al. 2008; Dawes, 2008).

Consistent with Lewis et al's (2005) suggestion, the same unit of analysis was used in all item stems and item statements during the development of the research instrument. As this study's main focus was the organization level of investment governance, the organization was used as the unit of analysis.

Following the creation of the research instrument, three tests (i.e., pre-test, pilot-test and content validity test) were conducted to ensure the face and content validity of the research instrument.

3.2.1. Pre-test

The pre-test objective was to critique, as required, the format, content, understandability, terminology, and ease and speed of completion of the instrument. This step also allowed us to ask participants to specify items that should be added or deleted from the instrument, as well as suggesting potential enhancements (Lewis, et al., 2005). This test was intended to acquire empirical feedback from expert participants to assess the appropriateness of the original survey instrument. This step involved 12 such participants consisting of eight IT academics and four IT professionals. They were requested to complete the research instrument via either an online or a paper-based medium. Based on their feedback on the instrument design, some minor adjustments were made, for example, adding definitions of terms used in the instrument and rewording some items to improve their understandability.

3.2.2. Pilot-test

Following the pre-test, a pilot test was performed. This pilot test was "a 'dress-rehearsal' of the instrument with a small sample" (Lewis et al., 2005, p. 392). The test involved 10 participants consisting of two IT auditors, four IT professionals, and four IT academics. They were asked to complete the online instrument and to give feedback on any difficulties they experienced when completing the instrument and suggestions for improvements. Based on their feedback, some improvements were made. Some questions were grouped differently to improve their logic and clarity by, for example, one generic set of questions per page. As well, survey items were differentiated by using distinct fonts and colors.

3.2.3. Content validity test

Lawshe's (1975) approach was empirical in that it screened the items in the ITIG construct and used a content validity ratio (CVR) to ensure content validity of the construct items. Based on their CVR, items that were not statistically significant were dropped from the survey instrument. This test involved a panel of experts consisting of eight internationally-renowned IT scholars in the area of IT governance. These panellists were sent a list of the items from the updated instrument and were asked to evaluate the relevance to the ITIG construct of each on a three-point scale: 1 = 'Not Relevant', 2 = 'Important (But Not Essential) and 3 = 'Essential'. The CVR is computed for each of the items using the following formula:

$$\mathbf{CVR = (n - N/2) / (N/2)}$$

where N = the total number of respondents, and n = the frequency count of the number of panellists who rated the item as appropriate, either 3 = 'Essential' or 2 = 'Important (But Not Essential)'. This study uses a less stringent measure by accepting both 2- and 3-rated responses. This approach is justifiable as "responses of both 'Important (But Not Essential)' and 'Essential' are positive indicators of an item's relevance to the construct" (Lewis et al., 2005, p. 393). Based on the threshold table of Lawshe (1975), the CVR of each item was evaluated for statistical significance at the 0.05 level. Out of the 29 original items, there were six non-significant items that were discarded from the study's research instrument. (See Table 3 for the content validity test results; items without an "*" were discarded).

(INSERT TABLE 3 HERE)

3.3. Stage III: Measurement properties

3.3.1. Data collection

An online survey based on the results of the content validity test and administered by an Australian-based survey panel vendor was sent to a panel of respondents. Prior studies indicate that results from panel surveys do not differ significantly from those collected from random mail samples (Dennis, 2001; Pollard, 2002; Skinner et al., 2009). Furthermore, previous IS studies have used survey panel vendors with reliable results (Lee et al., 2009; Wetzels et al., 2009). Survey panel vendors ensure only eligible respondents participate in the survey by having control measures such as unique login IDs and respondents' background profiles. The online survey itself also had several screening questions (e.g., job-title, type of industry) to ensure that only eligible participants took part in the survey (see Appendix 3).

The target respondents for this survey were directors, top management officers and other senior IT management members within Australian for-profit organizations. The use of perceptual data from top management members has been widely used in prior IT management research (Tallon, 2007; Kettinger & Marchand, 2011). We used a 7-point Likert-type scale (ranging from 1 = 'Not at all' to 7 = 'To a great extent') to ask respondents about the extent to which the 23 items of the ITIG construct had been applied by leaders of their organizations, namely: directors, top management (e.g., CEO, COO, CFO, and CIO) and IT managers (e.g., CIO, Director of MIS, and Manager of MIS) when governing IT investments in their organizations. In case any item in the survey was not applicable to their organization, we provided a 'not applicable' answer option (see Appendix 3).

3.3.2. Demographic data

Two hundred and thirty-one valid responses were collected from the survey, giving a response rate of 13.3 percent, which compares similarly to previous studies with top management members as the target respondents (Jeffers et al., 2008). The highest number of respondents classified themselves as Managing Director (44.6%), followed by General Manager (17.7%), and CEO (14.3%). Concerning experience in their current position, 35.5 percent of respondents responded 'less than 5 years' and 34.5 percent said 'between 5 to 10 years'. Respondents' ages were spread relatively evenly across all age groups. Thirty-two percent were between 41 and 50 years of age, and 28.8 percent were between 51 and 65. The highest percentages of respondents were from property/business services and retail/trade industries (13.4% & 13%, respectively). The average sales for the respondents' organizations was AU$1.24 billion per year, which compares similarly with prior studies of Australian for-profit organizations (Elbashir, 2006).

3.3.3. Data preparation

Recall that prior to factor analysis, data should satisfy normal statistical assumptions such as absence of outliers, normality, homoscedasticity, and linearity. Analyses using Z-scores, skewness and kurtosis, and scatter plot examinations (Ghiselli, et al., 1981; Coakes & Steed, 2003) revealed no concerns with violations of the statistical assumptions.

The data were tested to ensure no concerns with common method bias arose. Common method biases contribute to measurement errors, which in turn degrade the validity of the

conclusion about the relationships between variables (Podsakoff, Mackenzie, & Lee, 2003). Harman's single-factor test was used to detect any common method biases by performing an exploratory factor analysis (EFA) on all items used in this study (Malhotra et al., 2006; Podsakoff et al., 2003). A non-response bias test was also undertaken to establish the external validity of the sample data. Departures from these assumptions can diminish correlation between variables, resulting in degradation of the factor analysis solution (Hair et al., 1998). Following Jiang and Klein's approach (1999), samples were divided into two subgroups, namely, early and late respondents. Independent group t-tests were conducted across the items of the ITIG constructs. The aim of these tests was to examine if there was a systematic difference between the means for the two sets of scores (early and late respondents). The results of the T-tests indicated that all of ITIG's items had no significant differences except for IT value governance-b, IT Investment management-h, and IT Investment management-t. Later in the EFA, IT value governance-b was not included in the final EFA results. Despite having significant results in t-test, both IT Investment management-h and IT Investment management-t produced non-significant results for the Levene's Test for Equality of Variances. The non-significant result for the Levene's Test indicated that the population variances for IT Investment management-h and IT Investment management-t were similar (Coakes & Steed, 2003). Based on these results, both of the items were retained in the subsequent analyses.

3.3.4. Measurement properties analysis

The third stage was intended to measure properties of the ITIG construct (e.g., factorial validity, construct validity, and reliability) by performing analyses such as EFA, known groups analysis, and reliability analysis (Templeton, 2002; Lewis et al., 2005).

This study used EFA to empirically select the most important items to represent ITIG and to provide a statistical grouping of items with similar theoretical meaning (Kim & Mueller, 1982). The use of exploratory methods were appropriate "because (1) no theory exists based on testing the coexistence of all [three factors (IT investment governance, IT investment management, and IT investment portfolio management)] in a cohesive model, and (2) this research represents the initial empirical work done on the proposed factors" (Templeton et al., 2002, p. 197). Principal component analysis was used to establish empirically derived factors from the data.

The use of factor analysis was deemed appropriate for two reasons: first, it best applies to sample sizes greater than 50 and preferably 100 or larger (Hair et al., 1998); and second, it meets Bartlett's test of Sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. In this case, the KMO (0.941) was greater than 0.6 (Kaiser, 1974) and the Bartlett's test of Sphericity ($F=4219.933$, $DF=253$, $p=0.000$) was significant at $\rho < 0.001$ level (Bartlett, 1954). To determine the number of factors to be extracted in the EFA, we used two methods: First, we extracted factors with eigenvalues of one (1) or greater because the eigenvalue criterion for establishing a cut-off is most preferred for numbers of variables between 20 and 50 (Hair et al, 1998). Second, we examined a scree plot (see Gorsuch, 1983; Cattell, 1966) which, in keeping with our response size of 231, indicated that extracting four factors would be appropriate to measure ITIG.

Consistent with Templeton et al. (2002), several rotation techniques were tested on the original 23 items. Criteria such as simplicity (Kim & Mueller, 1982; Sethi & King, 1991), interpretability (Kachigan, 1982; Lederer & Sethi, 1992), and the percentage of variance explained (Straub, 1989) were applied to the rotated factor solutions. The rotation method that best satisfied these criteria was promax — an oblique rotation that assumes some correlation between items. This rotation "theoretically renders a more accurate and perhaps more reproducible solution" (Costello & Osborne, 2005, p. 3).

Based on the EFA result, 16 out of the 23 original items, grouped into four factors, were selected (see Table 4) and explained 69.99 percent of variance. The items' selection was based on having item factor loadings greater than 0.50. Prior exploratory studies recommend loadings in the range from 0.35 to 0.50 as the criterion for item selection (Straub, 1989; Sethi & King, 1991; Lederer & Sethi, 1992; Templeton et al., 2002). There were seven items that either had loadings less than 0.50 or cross-loaded on multiple factors. Those items were IT value governance-b, IT Investment management-o, value governance-a, IT Investment management-p, IT investment portfolio management-a, IT Investment management-b, and IT Investment management-q (see, Appendix 2). Accordingly, these items were dropped from further analysis.

The four factors were labelled by inference from the nature of the grouped items. The first factor was labelled 'IT investment value governance' (ITIVG), which we define as the degree to which the organization applies a set of structures and processes when governing the value of its IT investment throughout the full IT investment cycle. This definition implies that ITIVG ensures that the organizations establish formal structures and processes to help them govern their IT investment decisions throughout the life of the IT investment cycle. ITIVG contains six items with loadings ranging from 0.876 to 0.587 and represents structures and processes in IT investment decision making. They comprise a steering committee, formal processes to report new ideas in IT investment, involve different stakeholders in the evaluation processes, and use a formal business case. It also includes change management techniques for IT investment and a formal review after IT investment has been implemented.

The second factor was labelled 'IT investment value monitoring' (ITIVM). It refers to the degree to which top management in an organization applies a set of structures and processes when evaluating and monitoring the value of IT investments. ITIVM included four items with loadings ranging from 0.863 to 0.797 representing structures and processes in IT investment value monitoring. The structures and processes comprise reviewing large-spend IT investment proposals, approving IT investment cases, identifying the full costs associated with IT investment projects, and tracking the benefits and costs of large IT investments.

The third factor was labelled 'IT investment appraisals' (ITIA). It refers to the degree to which the top management in an organization applies a set of processes when appraising the value from IT investment initiatives. It contains three items with loadings ranging from 0.663 to 0.522 and it represents structures and process in IT investment evaluation. The IT initiatives cover both the IT investment portfolio and the IT investment project (i.e., individual IT investment). The processes use sensitivity analysis, balancing the business alignment and risk-return profile, and using analysis of flexibility.

The fourth factor was labelled 'IT investment project management' (ITIPM). It refers to the degree to which the IT management in an organization applies a set of processes when managing the value from IT investment projects. It contains three items with loadings ranging from 0.974 to 0.510 and it represents structures and processes in IT investment project management. The processes cover performing regular reviews during the IT project development stage, asking the end-users to verify that the new system meets the requirements at the completion of the IT project, and investigating the feasibility of replacement options toward the end of the IT project life-cycle.

Subsequent to the factor analyses, a reliability test was performed for the extracted factors. None of the factors' alpha was lower than 0.6 (see Table 4). These factors provided reliable and consistent measures of the intended ITIG construct.

(INSERT TABLE 4 HERE)

After the EFA, a "known groups analysis" was performed to further investigate and confirm construct validity. Following Templeton et al. (2002, p. 201), known groups analysis was performed by testing for differences in scores between classes of respondents that are expected to differ. If significant differences occur as expected, "known group analysis can support the notion that the instrument has construct validity." Firm size is an attribute used to differentiate between respondents and the level of influence of ITIG. Annual sales and IT budget were used as proxies for firm size (Cragg et al., 2002; Levy & Powell, 2002; Love et al., 2005). Table 5 below shows the correlation between the four ITIG factors with the annual sales and IT budget. All four factors correlate significantly with IT budget whereas two factors — IT investment value governance and IT investment appraisals — correlate significantly with annual sales. The results both confirm the previous studies and provide partial evidence that the derived measures exhibit construct validity.

(INSERT TABLE 5 HERE)

Finally, Table 6 statistically profiles the 16 items showing that almost all of those that made up the four ITIG dimensions on average received ratings greater than three. This result indicates that they were implemented to some extent within the organizations in the sample. The top three most implemented ITIG characteristics were Investment management-h (top management team members in our organization identify the full costs associated with IT investment projects to be 4.41), Investment management-g (Top management team members in our organization approve IT investment cases — 4.08) and Value governance-c (Top management team members in our organization track the benefits and costs of large IT investments — 4.08).

(INSERT TABLE 6 HERE)

4. Empirical Evidence: ITIG—Corporate Performance

To support the argument that ITIG is a resource that enables organizations to govern their IT investments more effectively and also support the predictive validity (i.e., effectiveness) of the developed ITIG construct. A further analysis was performed to examine the influence of ITIG on the overall level of corporate performance. The literature reports that higher levels of ITIG (i.e., higher levels of IT investment value governance, value monitoring, investment appraisals and project management) will result in higher levels of corporate performance (Kohli & Devaraj, 2004; Sherer, 2007; Bowen et al., 2007; Weill & Ross, 2004; De Haes et al., 2011). As a proxy for corporate performance, this study used firm efficiency and firm strategic growth (See Table 7). These constructs have been used and validated in prior studies (i.e., Premkumar & King, 1992; Saunders & Jones, 1992; Ali, Green, & Robb, 2013). Based on the criteria set out by Jarvis et al. (2003), the ITIG construct, firm efficiency, and strategic growth were modelled as reflective constructs.

(INSERT TABLE 7 HERE)

Figure 2 presents the research model used to investigate the ITIG construct's influence on the corporate performance variables, namely, firm efficiency and firm strategic growth, while controlling for organizational size (using annual sales and IT budget for proxies) (Rai et al., 2006). Given the limited number of empirical studies and the dearth of theory about ITIG (Joreskog & Wold, 1982; Rai et al., 2006), the model was analyzed using a partial least squares (PLS) approach via SmartPLS, focussing on a predictive research model rather than a confirmatory analysis. In the analysis, the ITIG construct was represented by the summated scales of the related constructs. They were derived by averaging the scores of the items used to measure each of the first-order constructs (Hair et al., 1998).

Following Churchill (1979) and Straub (1989), several tests were conducted to assess the measurement properties of all the constructs in the model. The tests conducted were reliability (i.e., Cronbach's Alpha and composite reliability), convergent validity (i.e., AVE), and discriminant validity (i.e., square root of AVE and construct cross-correlation matrix). The results showed that all the dimensions' alphas were greater than 0.6, all composite reliability points were above the minimum 0.8, and all AVE's were well above 0.50 (see Appendix 4). The results also revealed that, for each latent variable, the square root of its AVE was greater than its cross-correlations (see Table 8). These results indicated that the model had acceptably good measures (Fornell & Larcker, 1981).

(INSERT TABLE 8 HERE)

The structural evaluation of the model (see Figure 2) shows that ITIG significantly and positively influences both the overall level of firm strategic growth (structural link = 0.380, $p<0.001$) and efficiency (structural link = 0.330, $p<0.001$). The control variables (IT budget and sales) did not significantly influence corporate performance. Examining the predictive power of the path model, the results show that 16.2 percent of the variance in firm strategic growth and 11 percent of the variance in firm efficiency were explained by ITIG. The relatively low R-square values indicate that many other variables will impact upon corporate performance; also, in the absence of other variables, ITIG is still a significant explanatory variable of corporate performance. Furthermore, all the first-order factors of ITIG load significantly on the ITIG construct. This result confirms the explanatory factor analysis that ITIG is a multidimensional construct comprising four first-order factors (i.e., IT investment value governance, IT investment value monitoring, IT investment appraisals, and IT investment project management).

(INSERT FIGURE 2 HERE)

5. Conclusions, Limitations and Future Studies

The importance of governance for IT investments has been gathering increased attention in the business world. If firms can successfully measure their ITIG, this can help ensure their IT investments contribute positively to their organizations' overall performance. Supported by resource-based theory, this paper concludes that ITIG is an organizational capability that

enables organizations to more successfully acquire value from their IT investments so that they can achieve a more sustained competitive advantage (Barney, 2011; Mata et al., 1995).

This paper contributes to the existing body of knowledge about the ITIG construct and ultimately to business organizations by providing: (1) a consistent, research-derived conceptual definition for ITIG, (2) an empirically reliable and valid measure for ITIG as an resource for sustainable competitive advantage, and (3) potential guidance for top management in the implementation of effective ITIG. The first contribution is important particularly as it relates to the construct called "IT Investment Governance". ITIG measures the extent to which organizations govern their IT investments. The explanation is based on a domain definition grounded in the literature. The second contribution comes from the instrument that ensures reliability and validity of ITIG to the extent that it can potentially be used by directors and top managers for guidance when assessing and directing their firm's ITIG. These organizational leaders and managers can closely focus on the dimensions and the related items measures of ITIG, namely, value governance, value monitoring, investment appraisals, and project management when governing IT investments in their organization. The third contribution is that ITIG's dimensions and the measurement items can also be used as benchmarks for organizations to assess their current ITIG practices. Such benchmarking can help determine if any aspects of their ITIG need to be improved, thus helping them to increase the likelihood of maximizing value from their IT investments.

As with other research papers, this study has limitations. First, we focused only on human capital resources and organizational capital resources, because they are represented by ITIG. Unlike Barney (1991), physical capital resources are not included in the study. Second, the constructs (i.e., ITIG and corporate performance) are a subjective and indirect measure (based upon respondents' perceptions) and, hence, are not necessarily as strong as direct, objective measures. Third, the measurement instrument developed in this study for ITIG should be considered a first version that should undergo further empirical testing to improve its efficacy in IT investment studies. Fourth, the sampling frame in this study was limited to the panel group that self-selected to respond. The use of comprehensive screening criteria to facilitate the self-selection of appropriate participants, however, helped to mitigate representativeness problems. Furthermore, the context of this study should be considered when interpreting or applying the study's results in other settings (Lee et al., 2009).

Finally, this study offers some ideas for future studies. Because we believe that the ITIG concept continues to evolve, future studies could include adding new dimensions to the ITIG instrument. This paper examines the direct link between ITIG and corporate performance. While the results show that ITIG is significantly associated with corporate performance, future studies may also examine the link between ITIG and IT-enabled business processes to more clearly identify how effective governance of IT investment influences those processes. Moreover, identifying the antecedent and consequential factors that relate to the level of ITIG within organizations could lead to a fruitful research stream.

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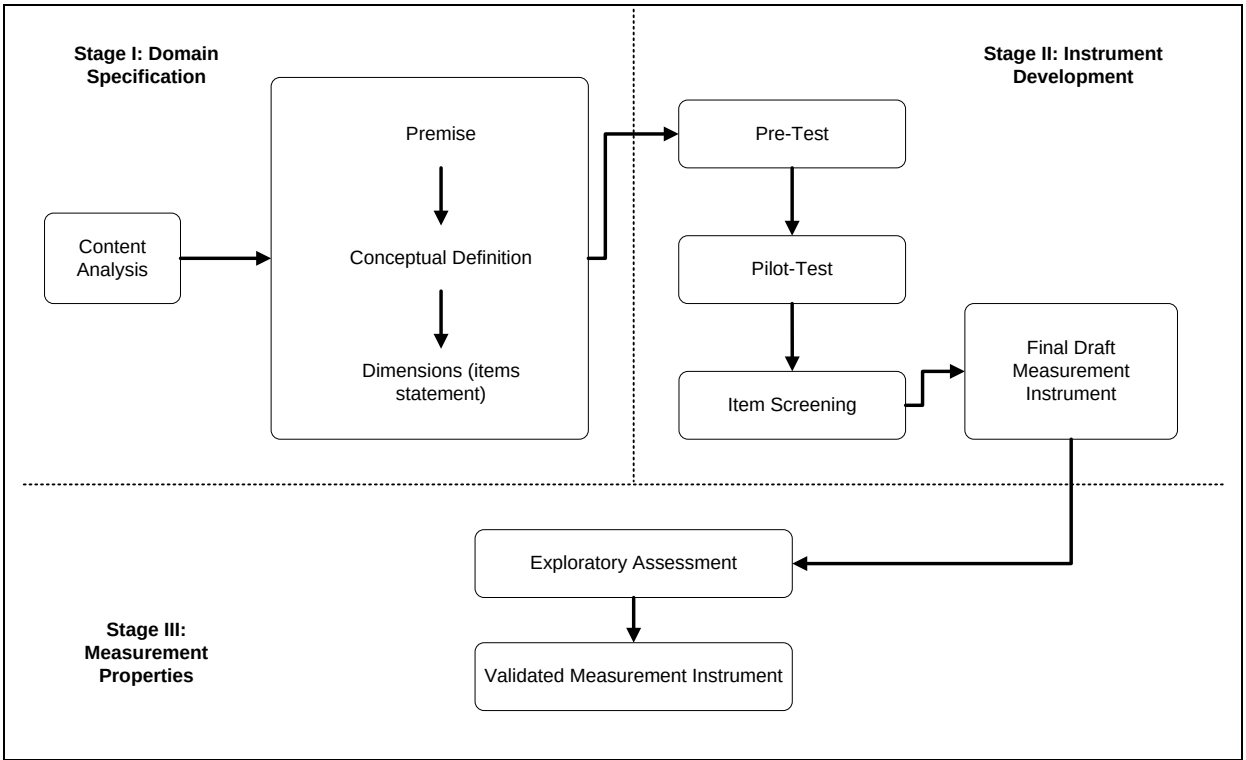

Figure 1 Construct Development Methodology (adapted from Lewis et al., 2005)

Table 1

IT Governance and Corporate Governance Definitions (Van Grembergen et al., 2004)

IT Governance Definitions:	Corporate Governance Definitions:
" [T]he organisational capacity exercised by the board, executive management and IT management to control the formulation and implementation of IT strategy and in this way to ensure the fusion of business and IT." (Van Grembergen, 2002, p.1).	"The framework of rules, relationships, systems and processes within and by which authority is exercised and controlled in the corporation. It encompasses the mechanisms by which companies, and those in control, are held to account." (ASX CGC, 2003, p.3).
IT Governance describes a firm's overall process for sharing decision rights about IT and monitoring the performance of IT (Weill and Vitale, 2002).	"Involves a set of relationships between a company's management, its board, its shareholders and other stakeholders. Corporate governance also provides the structure through which the objectives of the company are set, and the means of attaining those objectives and monitoring performance are determined." (OECD, 1999, p.2).
Governance is the responsibility of the board of directors and executive management. It is an integral part of Enterprise Governance and consists of the leadership and organisational structures and processes that ensure that the organisation's IT sustains and extends the organisation's strategies and objectives (IT Governance Institute, 2001).	"Corporate governance deals with the way in which suppliers of finance to corporate assure themselves of getting a return on their investment" (Shleifer and Vishny, 1997, p.737).

Table 2

ITIG Sub constructs, Criteria, and Item Stems

Sub construct	Criterion	Item code	Item stems (n=29)
IT value governance (VG)	value governance	VG-a	Evaluates IT investments against consistent and relevant criteria.
		VG-b	Uses a mechanism for the use of IT resources.
		VG-c	Tracks the benefits and costs of large organisation-wide IT investments.
IT Value governance (VG)	Decision-making and evaluation structure	VG-d	Reviews large spending IT investments proposals.
		VG-e	Has a steering committee to oversee major IT investments.
		VG-f	Has different stakeholder groups involved in the IT investments evaluation.
IT Investment management (IM)	IT risk management	IM-a	Balance many forms of risk in IT investments.
		IM-b	Identify risk types early in the IT evaluation.
IT Investment management (IM)	Idea generation	IM-c	Welcomes new ideas for IT investments from its stakeholders.
		IM-d	Uses a formal process to report new ideas in IT investments.
IT Investment management (IM)	Business case	IM-e	Use formal IT investments business cases.
		IM-f	Evaluates and scores IT investments cases.
		IM-g	Approve IT investments cases.
IT Investment management (IM)	Pre implementation evaluation	IM-h	Fully identify the costs associated with the IT investments project.
		IM-i	Uses sensitivity analysis.
		IM-j	Performs analysis of flexibility of the IT investments project.
		IM-k	Ranks alternatives of IT investments.
IT Investment	Change management	IM-l	Uses change management techniques.

management (IM)		IM-m	Training for the end-users.
IT Investment management (IM)	Post implementation evaluation	IM-n	Formal review after IT investments implementation.
		IM-o	Regular reviews of IT investments.
		IM-p	Assesses user perceptions of IT system performance.
IT Investment management (IM)	Project management	IM-q	Develops comprehensive IT investments project management metrics.
		IM-r	Regular review during IT project development stage.
		IM-s	Asks the end-users to verify that the new system does what is required.
		IM-t	Investigate the feasibility of replacement options toward the end of IT project life.
IT investment portfolio management (PM)	IT investment portfolio management	PM-a	Categorises a firm's IT investments portfolio.
		PM-b	Track separately the amount of each IT investment portfolio.
		PM-c	Balance the IT investments portfolio.

Table 3

Content Validity Results of the ITIG construct (n =8)

Item code	Item stems (n=29)	Mean	CVR
VG-a	Evaluates IT investments against consistent and relevant criteria	2.875	1.00*
VG-b	Uses a mechanism for the use of IT resource	2.000	1.00*
VG-c	Tracks the benefits and costs of large organisation-wide IT investments	2.875	1.00*
VG-d	Reviews large spending IT investments proposals	2.750	1.00*
VG-e	Has a steering committee to oversee major IT investments	2.625	1.00*
VG-f	Involves different stakeholder groups in the IT investments evaluation	2.750	1.00*
IM-a	Balance many forms of risk in IT investments	2.250	0.50
IM-b	Identify risk types early in the IT evaluation	2.375	0.75*
IM-c	Welcomes new ideas for IT investments from its stakeholders	2.125	0.50
IM-d	Uses a formal process to report new ideas in IT investments	2.500	0.75*
IM-e	Use formal IT investments business case	2.625	1.00*
IM-f	Evaluate and score IT investments case	2.500	0.50
IM-g	Approve IT investments case	2.750	1.00*
IM-h	Identify fully the costs associated with the IT investments project	2.750	1.00*
IM-i	Use sensitivity analysis	2.125	0.75*
IM-j	Use analysis of flexibility of the IT investments project.	2.375	0.75*
IM-k	Rank alternative of IT investments	2.000	0.50
IM-l	Uses change management techniques	2.125	0.75*
IM-m	Performs training for the end-user	2.250	0.25
IM-n	Performs formal review after IT investments implementation	2.875	1.00*
IM-o	Regular reviews of IT investments.	2.875	1.00*
IM-p	Assesses user perceptions of IT system performance.	2.500	1.00*
IM-q	Develops comprehensive IT investments project management metrics	2.500	1.00*
IM-r	Regular review during IT project development stage	2.625	1.00*
IM-s	Ask the end-users to verify that the new system does what is required	2.625	0.75*
IM-t	Investigate the feasibility of replacement options toward the end of IT project	2.000	0.75*

	life.		
PM-a	Categorise a firm's IT investments portfolio	2.250	0.75*
PM-b	Track separately the amount of each IT investment portfolio	2.250	0.50
PM-c	Balance the IT investments portfolio	2.500	0.75*

Notes: *significant at the 0.05 level
VG: value governance, IM: investment management, PM: portfolio management.

Table 4

Underlying Dimension of the ITIG construct

Factors and Contents		Loadings	Alpha
IT investment value governance (ITIVG)			0.912
VG-e	Our organisation involves a steering committee (e.g., IT investments committee/board) to oversee major IT investments.	0.876	
IM-l	Our organisation uses change management techniques (e.g., change agents or facilitators) for IT investments.	0.836	
IM-d	Our organisation uses a formal process to report new ideas in IT investments.	0.833	
VG-f	Our organisation involves different stakeholder groups (e.g., management and end-user) in the IT investments evaluation process.	0.784	
IM-e	Our organisation uses a formal business case generation approach for IT investments.	0.779	
IM-n	Our organisation performs formal reviews after IT investments' implementations.	0.587	
IT investment value monitoring (ITIVM)			0.861
VG-d	Top management team members in our organisation review large spending IT investments proposals.	0.863	
IM-g	Top management team members in our organisation approve IT investment cases.	0.863	
IM-h	Top management team members in our organisation identify the full costs associated with IT investment projects (e.g., tangible and intangible costs).	0.832	
VG-c	Top management team members in our organisation track the benefits and costs of large IT investments.	0.797	
IT investment appraisals (ITIA)			0.884
IM-i	Top management team members in our organisation uses sensitivity analysis (e.g., what-if analysis) for dealing with uncertainty in evaluating IT investments.	0.663	
PM-c	Top management team members in our organisation balance the IT investments portfolio for alignment and risk-return profile.	0.606	
IM-j	Top management team members in our organisation use analysis of flexibility (e.g., scalability, compatibility) of IT investment projects.	0.522	
IT investment project management (ITIPM)			0.798
IM-s	IT management members in our organisation ask the end-users to verify that the new system meets the requirements, at the completion of the IT project.	0.974	
IM-t	IT management members in our organisation investigate the feasibility of replacement options toward the end of the IT project life-cycle.	0.875	
IM-r	IT management members in our organisation perform regular reviews during IT project development stage.	0.510	

Table 5

Correlation between ITIG Dimensions, Annual Sales and IT Budget

Statistic	ITIG dimension	Annual Sales	IT Budget
Pearson correlation	IT investment value governance	0.174***	0.410***
	IT investment value monitoring	0.029	0.291***
	IT investment appraisals	0.144**	0.396***
	IT investment project management	0.112	0.340***

***. Significant at the 0.01 level

**. Significant at the 0.05 level

Table 6

Statistical Profile from Final Instrument Administration

Code	Item	Mean	S.D
IM-h	Top management team members in our organisation identify the full costs associated with IT investment projects (e.g., tangible and intangible costs).	4.41	2.22
IM-g	Top management team members in our organisation approve IT investment cases.	4.08	2.38
VG-c	Top management team members in our organisation track the benefits and costs of large IT investments.	4.08	2.39
IM-s	IT management members in our organisation ask the end-users to verify that the new system meets the requirements, at the completion of the IT project.	4.02	2.39
IM-t	IT management members in our organisation investigate the feasibility of replacement options toward the end of the IT project life-cycle.	4.02	2.36
VG-d	Top management team members in our organisation review large spending IT investments proposals.	4.00	2.48
IM-r	IT management members in our organisation perform regular reviews during IT project development stage.	3.68	2.3
IM-j	Top management team members in our organisation use analysis of flexibility (e.g., scalability, compatibility) of IT investment projects.	3.35	2.41
IM-i	Top management team members in our organisation uses sensitivity analysis (e.g., what-if analysis) for dealing with uncertainty in evaluating IT investments.	3.17	2.33
IM-n	Our organisation performs formal reviews after IT investments' implementations.	3.16	2.3
PM-c	Top management team members in our organisation balance the IT investments portfolio for alignment and risk-return profile.	3.10	2.27
IM-e	Our organisation uses a formal business case generation approach for IT investments.	2.98	2.23
VG-f	Our organisation involves different stakeholder groups (e.g., management and end-user) in the IT investments evaluation process.	2.92	2.27
IM-d	Our organisation uses a formal process to report new ideas in IT investments.	2.83	2.17
IM-l	Our organisation uses change management techniques (e.g., change agents or facilitators) for IT investments.	2.74	2.25
VG-e	Our organisation involves a steering committee (e.g., IT investments committee/board) to oversee major IT investments.	2.46	2.14

Table 7

Constructs of ITIG and Corporate Performance

Construct (Definition)	Measures	Type (number of items)	Literature
ITIG (as explained in Section 3.1.1)	Four first-order constructs: - IT investment value governance (ITIVG) - IT investment value monitoring (ITIVM) - IT investment appraisals (ITIA) - IT investment project management (ITIPM)	Reflective (4 items)	As explained in Appendix 2
IT contribution to firm efficiency (Extent that IT contributes to organizational efficiency)	The extent that IT has contributed to each of the following in your organization: - cost savings (EFF1) - operating efficiency (EFFI2) - process improvement (EFFI3)	Reflective (3 items)	Premkumar and King (1992); Saunders and Jones (1992); Chen et al. (2010); Ali et al., 2012.
IT Contribution to Strategic Growth (Extent that IT contributes to organizational strategic growth)	The extent that IT has contributed to each of the following in your organization: - return on investment (EFFE1) - sales revenue increase (EFFE2) - market share (EFFE3)	Reflective (3 items)	Premkumar and King (1992); Saunders and Jones (1992); Chen et al. (2010); Ali et al., 2012.

Table 8

Assessment of Discriminant Validity

	EFFE	EFFI	ITIG	ITBGT	Sales
Strategic Growth (EFFE)	0.891	0	0	0	0
Organisational Efficiency (EFFI)	0.612	0.848	0	0	0
IT Investment Governance (ITIG)	0.399	0.331	0.858	0	0
IT Budget (ITBGT)	0.202	0.136	0.417	NA	0
Sales	0.049	0.028	0.132	0.327	NA

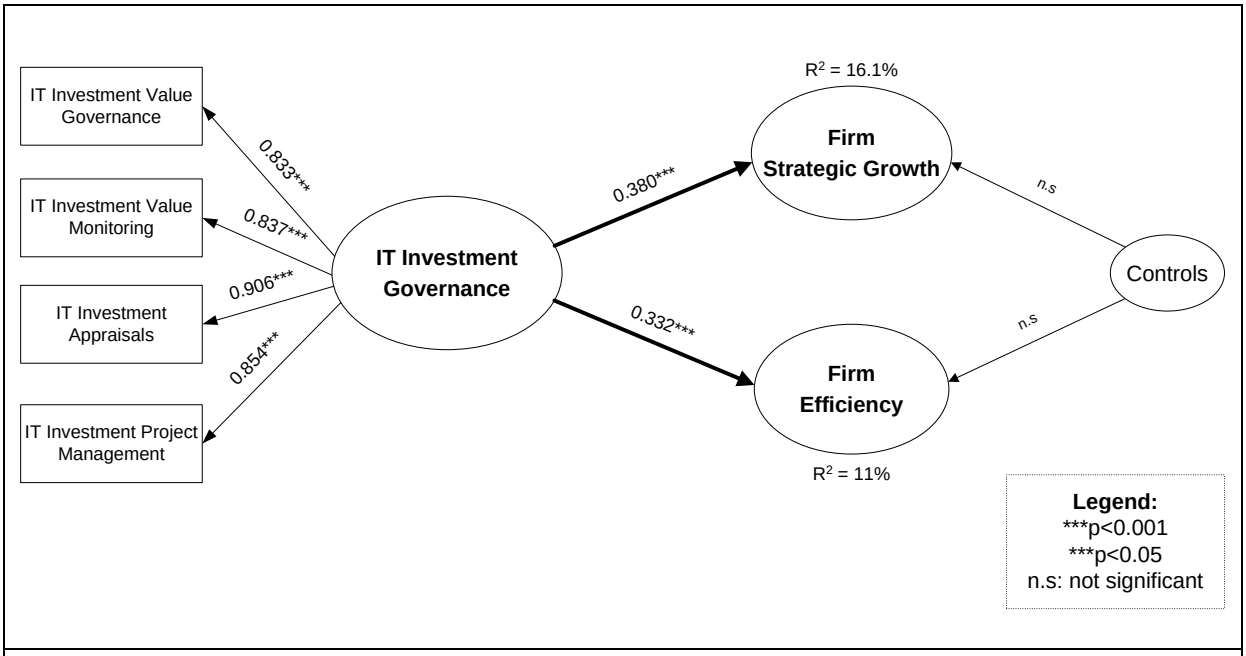

Figure 2 Empirical Evidence: ITIG-Corporate Performance (SmartPLS)

Appendix 1: ITIG Framework		
Framework (developed by)	**Components**	**Orientation**
Information Technology Investment Management (Government Accounting Office-USA)	1. Creating investment awareness, 2. Building the investment foundation, 3. Developing a complete investment portfolio, 4. Improving the investment process, 5. Leveraging IT for strategic outcomes.	Not-for profit Organisations
Val-IT 2.0 (IT Governance Institute)	1. Value governance, 2. Portfolio management, 3. Investment management	Profit Organisation
ITIG (This study)	1. IT investment value governance 2. IT investment value monitoring 3. IT investment appraisals 4. IT investment project management	Profit Organisation

Appendix 2: Items and their Supporting Literature

Item code	Item	Supporting Literature
VG-a	Our organisation evaluates IT investments against consistent and relevant set of management goals and business criteria. **	Hochstrasser (1990); Davern and Kauffman, 2000; Bajaj et al. (2008); Ward (1990); Sherer et al. (2002); Butler et al. (1993); De Haes et al. (2011)
VG-b	Our organisation uses mechanisms (such as a charge back system) for the use of IT resource. **	Ross et al., (1999); De Haes and Van Grembergen (2008b); Bacon (1992); Peppard (2007).
VG-c	Top management team members in our organisation track the benefits and costs of large IT investments. ***	Hochstrasser (1990); Farbey et al., (1992); Weill and Olson (1989); Mitra et al., (2011)
VG-d	Top management team members in our organisation review large spending IT investments proposals. ***	Irani and Love (2002); Tallon et al. (2000); Weill and Olson (1989); De Haes et al. (2011)
VG-e	Our organisation involves a steering committee (e.g., IT investments committee/board) to oversee major IT investments. ***	Ask et al. (2007); De Haes and Van Grembergen (2008b); Peters (1990); Fitzgerald (1998); Sherer (2007); Bowen et al., (2007); Lentz et al. (2002), Huang et al., 2010; De Haes et al. (2011)
VG-f	Our organisation involves different stakeholder groups (e.g., management and end-user) in the IT investments evaluation process. ***	Hochstrasser (1990); Farbey et al., (1992); Ashurst et al. (2008); Peppard et al. (2007); Fitzgerald (1998); Hallikainen, et al. (2002); Kohli and Devaraj (2004); Kim and Kankanhalli (2009); Wilkin et al. (2012); Rivard and Lapointe (2012)
IM-a	Our top management team members in our organisation balance many forms of risk in IT investments. *	Aral and Weill (2005); Jeffery and Leliveld (2004); Karadag et al., (2009); Fitzgerald (1998); Clemons (1991)
IM-b	Our top management team members in our organisation identify risk types early in the IT evaluation. **	Clemons and Weber (1990); Karadag et al., (2009); Fitzgerald (1998).
IM-c	Our organisation welcomes new ideas for IT investments from its stakeholders. *	Hallikainen, et al. (2002); Sherer (2007); Kohli and Devaraj (2004).
IM-d	Our organisation uses a formal process to report new ideas in IT investments. ***	Ask et al. (2007); Ross and Beath (2002); Karadag et al., (2009); Ryan and Gates (2004); Hallikainen, et al. (2006); Sherer (2007); Bowen et al., (2007).
IM-e	Our organisation uses a formal business case generation approach for IT investments. ***	Ask et al. (2007); Farbey et al., (1992); Jeffery and Leliveld (2004); Ross and Beath (2002); Karadag et al., (2009); Kumar (1990); Ryan and Gates (2004); Freedman (2003); Hallikainen, et al. (2006); Sherer (2007); Kohli and Devaraj (2004); Bowen et al., (2007) De Haes et al. (2011).
IM-f	Our top management team members in our organisation evaluate and score IT investments case. *	Ask et al. (2007); Irani and Love (2002); Jeffery and Leliveld (2004); Ross and Beath (2002); Freedman (2003); Van Over (2009); Mitra et al., (2011)
IM-g	Top management team members in our organisation approve IT investment cases. ***	Ask et al. (2007); Irani and Love (2002); Ross and Beath (2002); Karadag et al., (2009); Freedman (2003).
IM-h	Top management team members in our organisation identify the full costs associated with IT investment projects (e.g., tangible and intangible costs). ***	Hochstrasser (1990); Irani and Love (2002); Fitzgerald (1998).

IM-i	Top management team members in our organisation uses sensitivity analysis (e.g., what-if analysis) for dealing with uncertainty in evaluating IT investments. ***	Clemons and Weber (1990); Fitzgerald (1998); Clemons (1991); Hallikainen, et al. (2002).
IM-j	Top management team members in our organisation use analysis of flexibility (e.g., scalability, compatibility) of IT investment projects. ***	Farbey et al., (1992); Fitzgerald (1998).
IM-k	Our top management team members in our organisation rank alternative of IT investments. *	Ashurst et al. (2008); Kearns (2004); Clemons (1991); Hallikainen, et al. (2002); Lentz et al. (2002).
IM-l	Our organisation uses change management techniques (e.g., change agents or facilitators) for IT investments. ***	Ashurst et al. (2008); Ryan and Gates (2004); Sherer, et al. (2003); Van Over (2009); Van Over (2009); Sherer (2007); Kohli and Devaraj (2004), Kim and Kankanhalli (2009); Singh et al., 2009; Rivard and Lapointe (2012); Wilkin et al. (2012).
IM-m	Our organisation performs training for the end-user. *	Davern and Kauffman, 2000; Ashurst et al. (2008).
IM-n	Our organisation performs formal reviews after IT investments' implementations. ***	Hochstrasser (1990); Farbey et al., (1992); Tallon et al. (2000); Ward (1990); Peters (1990); Kumar (1990); Norris (1996); Sherer et al. (2002); Sherer (2007); Lentz et al. (2002); Mitra et al., (2011)
IM-o	Our top management team members in our organisation perform regular reviews of IT investments. **	Hochstrasser (1990); Farbey et al., (1992); Tallon et al. (2000); Ward (1990); Peters (1990); Ashurst et al. (2008); Peppard et al. (2007); Mitra et al., (2011)
IM-p	IT management members in our organisation assess user perceptions of IT system performance. **	Ashurst et al. (2008); Fitzgerald (1998).
IM-q	IT management members in our organisation develop comprehensive IT investments project management metrics. **	Kohli and Devaraj (2004); Ewusi-Mensah (1997); Nah et al (2003); Lentz et al. (2002); Mitra et al., (2011)
IM-r	IT management members in our organisation perform regular reviews during IT project development stage. ***	Hochstrasser (1990); Farbey et al., (1992); Peters (1990); Ashurst et al. (2008); Peppard et al. (2007).
IM-s	IT management members in our organisation ask the end-users to verify that the new system meets the requirements, at the completion of the IT project. ***	Farbey et al., (1992); Ashurst et al. (2008).
IM-t	IT management members in our organisation investigate the feasibility of replacement options toward the end of the IT project life-cycle. ***	Farbey et al., (1992); Ross and Beath (2002).
PM-a	Our top management team members in our organisation categorise a firm's IT investments portfolio classifications (e.g., strategic, informational, transactional, and mandatory). **	Ward (1990); Aral and Weill (2005); Jeffery and Leliveld (2004); Weill and Olson (1989); Freedman (2003); Kumar et al. (2008).
PM-b	Our top management team members in our organisation track separately the amount of each IT investment portfolio. *	Ward (1990); Aral and Weill (2005); Jeffery and Leliveld (2004); Weill and Olson (1989); Freedman (2003).
PM-c	Top management team members in our organisation balance the IT investments portfolio for alignment and risk-return profile. ***	Ward (1990); Aral and Weill (2005); Jeffery and Leliveld (2004); Peters (1990); Clemons (1991); Weill and Olson (1989); Freedman (2003); Kumar et al. (2008); De Haes et al. (2011)

Notes:
* Item deleted in the content validity test stage; ** Item deleted in the EFA stage; ***Item retained in this study

Appendix 3: Final Questionnaire Instrument

Demographics Information

(1). Age (Please select your age group):

- <18
- 18-24
- 25-30
- 31-35
- 36-40
- 41-45
- 46-50
- 51-55
- 56-60
- 61-65
- Over 65

(2). Please select the classification which best describes your organisation's industry.

- Agriculture/Forestry/Fishing
- Mining
- Manufacturing
- Electricity/Gas/Water Supply
- Construction
- Wholesale Trade
- Retail Trade
- Accommodation/Cafes/Restaurants
- Transport/Storage
- Communication Services
- Finance/Insurance
- Property/Business Services
- Government Administration/Defence
- Education
- Health/Community Services
- Cultural/Recreational Services
- Personal/Other Services

(3). Please select the category which best describes your title within your organisation.

- Board Member
- Managing Director
- Chief Executive Officer
- General Manager
- Chief Financial Officer
- Chief Operating Officer
- Chief Information Officer
- Director of Finance
- Director of MIS/IT
- Manager of MIS/IT
- IT Controller
- Project Manager
- Internal Auditor

- ❍ Department Manager
- ❍ Group Manager
- ❍ Supervisor
- ❍ Team Leader
- ❍ Others

(4). How long have you been serving in your current position?

- ❍ <5 years
- ❍ 5.1-10 years
- ❍ 10.1-15 years
- ❍ >15 years

(5). For the previous financial year, what was your organisation's total sales figure?

- ❍ <99 million A$
- ❍ 100 - 499 million A$
- ❍ 500 - 2,499 million A$
- ❍ 2,500 - 9,999 million A$
- ❍ >10,000 million A$

(6). What was your organisation's annual IT budget for the previous financial year as a percent of annual revenue?

- ❍ <0.5%
- ❍ 0.5% - 1.5%
- ❍ 1.51% - 2.5%
- ❍ 2.51% - 3.5%
- ❍ 3.51% - 4.5%
- ❍ 4.51% - 5.5%
- ❍ >5.5%

Question 7:

The items in this question focus on different practices that your organisation applies when governing IT investments. They relate to structures and processes within your organisation that may be applied in order to govern IT investments. [IT investments refer to investments that relates to an organisation's collection of (computer based) information systems, their users, and the management that oversee them.]

Please indicate the extent that your organisation applies the following practices:

Scale: 1= Not at all; 4= To some extent; 7= To a great extent; N/A= No basis for answering

	1	2	3	4	5	6	7	N/A
(a). Evaluating IT investments against a consistent and relevant set of management goals and business criteria.								
(b). Using mechanisms such as charge-back systems for the use of IT resources.								
(c). Involving a steering committee (e.g. IT investments committee/board) to oversee major IT investments.								
(d). Involving different stakeholder groups (e.g., management and end-user) in the IT investments evaluation process.								
(e). Using a formal process to report new ideas in IT investments.								
(f). Using a formal business case generation approach for IT investments.								
(g). Using change management techniques (e.g., change agents or facilitators) for IT investments.								
(h). Performing formal reviews after IT investments' implementations.								

(i). Performing regular reviews of IT investments.								
(j). Assessing user perceptions of IT system performance.								

Question 8:

The items in this question focus on different practices that the top management team members in your organisation apply when governing IT investments. They relate to structures and processes within your organisation that Top Management Team members may apply in order to govern IT investments. [Top Management Team members refer to the CEO, COO, CFO, and other senior executives responsible for the various functions and business groups. This could also include the Senior IT executive (e.g. Chief Information Officer "CIO')].

Please indicate the extent to which top management team members in your organisation apply the following practices:

Scale: 1= Not at all; 4= To some extent; 7= To a great extent; N/A= No basis for answering

	1	2	3	4	5	6	7	N/A
(a). Tracking the benefits and costs of large IT investments.								
(b). Reviewing large spending IT investments proposals.								
(c). Categorizing the firm's IT investments portfolio classifications (e.g., strategic, informational, transactional, and mandatory).								
(d). Balancing the IT investments portfolio for alignment and risk-return profile.								
(e). Identifying risk types early in the evaluation of IT investments.								
(f). Approving IT investment cases.								
(g). Identifying the full costs associated with IT investment projects (e.g., tangible and intangible costs).								
(h). Using sensitivity analysis (e.g., what-if analysis) for dealing with uncertainty in evaluating IT investments.								
(i). Using an analysis of flexibility (e.g., scalability, compatibility) of IT investment projects.								

Question 9:

The items in this question focus on different practices that IT management team members use when governing their IT investments. They relate to structures and processes within your organisation that IT Management Team members may apply in order to govern IT investments. [IT management team members refer to the persons who are responsible and accountable for an ongoing program of IT services in an organisation such as CIO, Director of MIS, Manager of MIS, IT controller, Senior system analyst, and Project manager].

Please indicate the extent to which IT management members in your organisation use the following practices:

Scale: 1= Not at all; 4= To some extent; 7= To a great extent; N/A= No basis for answering

	1	2	3	4	5	6	7	N/A
(a). Developing comprehensive project management metrics (e.g., costs, benefits, outcomes) for IT investments.								
(b). Performing regular reviews during IT project development stage.								
(c). Asking the end-users to verify that the new system meets the requirements, at the completion of the IT project.								
(d). Investigating the feasibility of replacement options toward the end of the IT project life-cycle.								

Appendix 4: Summary of the Measurement Model

Panel A: AVE, Cronbach's Alpha and CR

Measurement	ITIG	EFFE	EFFI
Average Variance Extracted (AVE)	0.736	0.793	0.718
Cronbach's Alpha	0.880	0.871	0.810
Composite Reliability (CR)	0.917	0.920	0.884

Panel B: Item-Construct Correlation

	ITIG	EFFE	EFFI
ITIVG	0.833	0.294	0.233
ITIVM	0.836	0.318	0.279
ITIA	0.906	0.382	0.279
ITIPM	0.854	0.361	0.333
EFFE1	0.264	0.890	0.578
EFFE2	0.409	0.896	0.536
EFFE3	0.360	0.883	0.531
EFFI1	0.280	0.604	0.818
EFFI2	0.166	0.442	0.830
EFFI3	0.341	0.493	0.892