Intellectual capital and business performance - an exploratory study of the impact of cloud-based accounting and finance infrastructure

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Abstract

Purpose
This study, building on previous studies of Intellectual Capital (IC) and business performance, is an exploratory study of how the use of cloud-based accounting/finance infrastructure affects business performance.

Design/methodology/approach
A survey method is used to capture perceptions of how cloud-based accounting/finance infrastructure affects business performance in small and medium-sized enterprises (SMEs). The study assumes that although accounting/finance systems are generally regarded as one element of a firm's structural capital; the introduction of a cloud-based infrastructure in the accounting/finance area has the potential to positively impact on all three elements of a firm's IC. Based on the survey data collected, a conceptual model was formulated to test the relationship between cloud-based accounting/finance infrastructure and business performance through the prism of firms' IC.

Findings
The results indicate that cloud-based accounting/finance infrastructure have a positive and statistically significant impact on human capital and relational capital. On structural capital, although positive, the relationship is not statistically significant. On the relationship between the three components of IC and business performance, all three elements are both positive and statistically significant. Furthermore, the R^2 value generated for the ultimate endogenous construct of our hypothesised conceptual model, i.e. "Business Performance" is 71.3%, indicating significant model explanatory power.

Research limitations/implications
Our findings suggest further more in-depth research is needed to explore in detail the effects of cloud-based accounting/finance infrastructure on both the IC and subsequent business performance of SMEs.

Originality/value
Studies on the effects of cloud-computing on accounting are scarce. This exploratory research suggests that cloud-based accounting/finance infrastructure can potentially improve the business performance of SMEs. While a valuable finding in itself, more research in this area is to be encouraged.

Key words: cloud computing, accounting/finance, Intellectual Capital, business performance.

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1. Introduction

The success of modern firms partially depends upon their ability to invest in new technologies that facilitate the exploitation of new commercial opportunities and/or improved incumbent business processes – in other words, allows a firm to adapt. This paper focuses on adaptions to firms accounting/finance systems infrastructure. According to the accounting literature, drivers of accounting change can be identified in three broad categories, namely: (1) increasing globalisation; (2) improved information technologies; and, (3) improved methods of production (Burns *et al.*, 1999; Russel and Siegel, 1999; Scapens *et al.*, 2003). Here, we focus on improved information technologies and specifically on cloud computing. Recently, it has been claimed that the technological development that is cloud computing, has the capability to transform how firms and society as a whole operates – as noted by Edvinsson (2013, p.167) "cloud computing and social media will play a growing power role for the new societal fabric". We could therefore postulate that the adoption of cloud-based accounting/finance infrastructure is one element of this transformation. As such, it is worthy of research in a similar way the effects of enterprise systems were in the past decade (see for example, Davenport, 2000; Granlund and Malmi, 2002; Murphy and Simon, 2002; Shang and Seddon, 2002).

The advent of cloud computing has allowed firms of varying sizes to avail of enhanced processing power, storage, hardware and networking capacity, without a corresponding capital investment requirement (see Marston *et al.*, 2011). Alongside such potential operational benefits, it has been suggested that the use of cloud computing from a human resources (HR) perspective can potentially improve organisational performance, innovativeness and ultimately a firm's Intellectual Capital (IC) (Afshari, 2014; Bhadani, 2014). IC is defined here as a firm's collection of human capital (e.g. employee knowledge and experience), structural capital (e.g. organisational systems and databases) and relational capital (e.g. internal and external relationships), which through their interaction can potentially positively affect subsequent business performance (see for example, Mention and Bontis, 2013; Novas *et al.*, 2012; Sharabati *et al.*, 2010).

According to Edvinsson (2013, p.166), "for more than five centuries, accounting has been an instrument for assessing knowledge, directly or indirectly". However, despite the fact that the use of cloud computing may potentially transform the accounting function to become front-office focused and hence, strategic, it has been suggested that accounting within firms remains predominantly back-office orientated (Young, 2010). However, some recent evidence suggests that small and medium-sized enterprises (SMEs) are beginning to adopt cloud technologies for their accounting/finance infrastructure and gaining advantages, but less so than other functions such as sales and customer service (see for example, Quinn *et al.*, 2014).

Prior research has regarded firms' accounting/finance infrastructure as part of their structural capital (Booth, 1998; Lynn, 1999; Novas *et al.*, 2012; Roberts, 2003). We argue that if a cloud-based accounting/finance infrastructure is adopted by firms' (i.e. their incumbent accounting/finance systems are based on cloud computing technologies), it has the potential to strengthen all three elements of their IC, which in-turn can positively impact on their subsequent business performance. This currently unfounded proposition is what this paper explores by proposing and testing a model on the effects of cloud-based accounting/finance infrastructure on IC and business performance (see Section 4, later).

The remainder of the paper is organised as follows. Section Two contains a comprehensive literature review, culminating with an argument for the present study. Section Three describes the research methodology used, Section Four outlines the research findings and model, and finally, Section Five outlines some concluding comments and suggests avenues for future research.

2. Literature Review

In this section, we review extant literature relevant to this research. First, we detail the general and accounting literature on cloud computing, although the latter is not abundant. Second, we detail literature on IC, and review previous studies which examine its relationship to business performance. Third, we outline the potential synergy between cloud computing, accounting/finance and IC, to justify our rationale for this research study.

2.1 Cloud computing

Cloud computing generally refers to the centralisation of all or part of a firm's computer resources via a shared provider of such services (Mongan, 2011). Access to the cloud is normally through an internet-enabled device and is generally limited to relevant authorised users. The US-based National Institute for Standards and Technology (NIST) defines cloud-computing as follows:

> "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (NIST, 2011, p.2).

The NIST (2011) also outline three basic models of cloud computing. First, Software-as-a-Service (SaaS) allows a cloud user to run software programs on cloud infrastructure. Several accounting software products are currently offering this service (see for example, Kristandl and Quinn, 2012). In this model, any internet enabled device (notebooks, personal computers, tablet and smartphones) can use the service. Second, Platform-as-a-Service (PaaS) allows a cloud user to develop or deploy applications/software using tools and infrastructure provided by the cloud service provider. Finally, Infrastructure-as-a-Service (IaaS), is the provision of resources such as storage and other hardware in the cloud. The user in this instance may also deploy various operating systems. This model permits the most control over the use of computing resources.

The potential benefits to a firm of using cloud computing include; lower IT costs, lower barriers to innovation, global data/systems availability, the ability to scale IT requirements as required and automatic access to system/software updates (Du and Cong, 2010; Marston *et al.,* 2011; Robinson, 2011). For smaller firms, cloud computing facilitates the utilisation of powerful information technology (IT) infrastructure and software which was previously the main domain of larger firms due to significant capital investment requirements (Drew, 2012; Paul, 2010). Furthermore, cloud computing has the potential to free up scarce resources in all areas of a firm's business, including accounting/finance (see, for example, Strauβ *et al*, 2014). Such resources would otherwise have been expended primarily on IT maintenance rather than being used for more strategic and value creating purposes (Gill, 2011).

However, rather than focusing on the potential advantages associated with using cloud computing, accountants thus far seem to be more concerned with issues such as data protection, reliability and privacy (Howlett, 2011; Quinn *et al*., 2014). Other issues associated with the use of cloud computing include data ownership and security (Connolly, 2010; Strauβ *et al*, 2014). In response; it has been argued by numerous cloud computing service providers that users of cloud-based systems are inherently more secure than similar bespoke organisational systems as they are supported by more specialised and numerous IT personnel (Du and Cong, 2010). Notwithstanding these reassurances, it has been argued by some accountants that while adopting cloud computing can be advantageous, as yet it cannot fulfil the specific requirements associated with a firm's accounting/finance systems (Cooper, 2011; Quinn *et al*., 2014).

In a similar vein, doubts about the suitability of using cloud computing for accounting/finance purposes have also emerged from the contention that the accounting function is a primary repository for critical operational data. It therefore may not be suitable for migration to the cloud (Gill, 2011), or may be left until other systems have been tried and tested in the cloud before doing so (Quinn *et al*., 2014; Strauβ *et al*, 2014). However, at odds with these assertions, it has also been claimed that from an accounting perspective, the use of cloud computing can potentially increase the flow of information within an organisation by ensuring it becomes more formalised and accessible. By doing so, it can facilitate enhanced organisational decision-making at all levels (Young, 2010), which can potentially positively impact upon subsequent organisational performance. Indeed, Quinn *et al.* (2014) noted that "the main advantage [of cloud computing] cited was an efficiency improvement in business processes" (p.55).

2.2 Intellectual Capital

As suggested in the introduction, for firms to prosper in an increasingly competitive global economy, it is imperative they harness their limited IC to its fullest potential by whatever means possible (Paul, 2010). As stated earlier, it is generally accepted that IC consists of a firm's collection of human capital, structural capital and relational capital. On accounting/finance, it has been posited that it most comfortably sits as an element of structural capital (Booth, 1998; Lynn, 1999; Roberts, 2003). Structural capital itself has been defined as "a valuable strategic asset, which is comprised of non-human assets such as information systems, routines, processes and databases. It is the skeleton and the glue of an organisation because it provides the tools and architecture for retaining, packaging and moving knowledge along the value chain" (Cabrita and Bontis, 2008, p.217). Based on this definition, it is quite apparent that accounting is indeed an element of structural capital; for example, consider literature on accounting information systems or studies which regard accounting as organisational routines (see for example, Burns and Scapens, 2000; Quinn, 2011, 2014). Indeed, previous research has attempted to explore the relationship between management accounting and IC. For example, Novas *et al.* (2012) reported a positive and statistically significant relationship between structural capital and management accounting systems, although findings from Cleary (2015) do not support this assertion.

As will be outlined in Section 3, we specifically targeted SMEs for our study. Research has demonstrated that management accounting in SMEs is initially narrow and informal, before becoming more formal and extensive as the firm enlarges over time (Davila and Foster, 2007; Giovannoni *et al.*, 2011; Hiebl, 2013). The literature also acknowledges that management accounting (whether formal or informal) is vital for small business growth, performance and survival (Argilés and Slof, 2003; Perren and Grant, 2000; Davila and Foster, 2007; Sandino, 2007). Within SMEs, owner-managers and internal accountants are the primary creators (and sometime enactors) of management accounting routines (see for example, Hiebl *et al.,* 2012), which over time may become more formalised. Although control is generally maintained over these routines by their creator, they may become harmonised into organisational specific management accounting "rules" as the business continues to grow (Perren and Grant, 2000). Furthermore, it has been suggested that the origin of objectified (or harmonised) management accounting knowledge within SMEs generally consists of a combination of the past personal experiences of owner-managers, external management accounting expertise, accompanying computer software and previously acquired management accounting knowledge by the firm's employees (Perren and Grant, 2000).

As organisational knowledge (including accounting/finance) is created by a firm's employees, a dilemma for firms' is how to extract and transfer such knowledge across the organisation so as to contribute towards subsequent enhanced organisational performance (Bontis and Fitz-enz, 2002; Bontis *et al.*, 2000; Bontis, 1998; Cabrita and Bontis, 2008; Do Rosario Cabrita and Landeiro Vaz, 2006; Garcia-Ayuso, 2003; Grant, 1997; Ordonez de Pablos, 2002; Wang and Chang, 2005). Put another way, the dilemma is how to embody created knowledge as part of the firm's IC. Empirically testing the relationship between the various elements of IC and business performance is not a simple task as there is no consensus on how to best to measure a firm's IC (Clarke *et al.*, 2011). Despite this, extant studies show a very strong correlation between IC and firm performance. For example, Sharabati *et al.* (2010) and Cabrita and Bontis (2008) found that both relational capital and structural capital had a positive impact on firm performance, whereas Novas *et al.* (2012), Jardon and Martos (2009) and Ordonez de Pablos (2002) reported that structural capital alone had a positive and significant relationship with firm performance. In contrast, Mention and Bontis (2013) found that only human capital had a positive and significant relationship with business performance. One plausible explanation for these contrasting findings may be the fluid nature of IC (due to its organisational specific composition). Thus, direct comparisons between firms, industries and countries are difficult (Mouritsen, 2006).

2.3 Cloud computing, accounting/finance and Intellectual Capital

As noted, by adopting cloud computing a firm can potentially utilise their valuable resources (both tangible and intangible) for more strategic purposes, thereby creating real organisational value. From the accounting/finance perspective, continued use of traditional, custom designed proprietary systems that are expensive and time-consuming to continually upgrade, represents a major reason for consider migrating some/all of their accounting/finance systems to a cloud-based environment (Gill, 2011). Start-up and small-sized firms with little previous IT expenditure have thus far been very proactive in their adoption of cloud computing. Medium-sized firms who have already committed significant sums of capital to their own IT infrastructures, are less willing to migrate to the cloud (Young, 2010). For larger firms, although the potential benefits of using shared applications are less obvious and consequently, they may be more inclined to develop their own private cloud infrastructure (Du and Cong, 2010; Strauβ *et al*, 2014).

The potential for technologies such as cloud computing in the accounting/finance domain to facilitate enhanced business performance has yet to be adequately determined. Here, we hope to provide some support for the contention that cloud-based accounting/finance infrastructure n organisations can play a key role in the management of IC - with the ultimate objective of improving overall business performance (see for example, Edwards *et al.*, 2005; Sofian *et al.*, 2004; Tayles *et al.*, 2002). With this in mind, the objective of this paper is to explore the impact of cloud-based infrastructure in the accounting/finance area on the IC of SMEs, the subsequent business performance of such firms.

3. Research Methodology

Ireland is a leading force in cloud computing implementation and research with some commentators proposing it as the cloud computing capital of Europe[1]. Also, as noted previously, SMEs have the potential to realise numerous benefits from using cloud computing technologies. We therefore selected a sample of Irish-based SMEs for this study. Irish SMEs represented 97% of Irish business in 2012 (Lawless *et al.*, 2012), which is similar to other European countries. Additionally, it is interesting to note that while Irish SMEs accounted for approximately 50% of private-sector economic value added at that time, they provided employment for 70% of private-sector employees (European Commission, 2013). This suggests significantly lower labour productivity than expected within this sector, which could potentially be enhanced by the adoption and use of cloud computing. Thus, choosing Irish SME firms as the sample for this study supports the exploratory nature of this study.

Based upon a review of the IC and cloud computing literature, an on-line survey was constructed consisting of a 41 statements (items) in five main areas (constructs). The on-line survey instrument was developed using Qualtrics survey software. The five constructs are 1) cloud-based accounting/finance infrastructure, 2) human capital, 3) structural capital, 4) relational capital and, 5) business performance. Respondents were requested to provide their perceptual response to a series of statements on a five point scale ranging from "Strongly Disagree" to "Strongly Agree". Appendix I provides full details of the items used in each of the five constructs. Once developed, the survey was piloted with a number of respondents (19 in total). The pilot respondents included; professional accountants, managers and accounting staff of Irish SMEs, and academic colleagues. Based on feedback received, some minor amendments were made to the survey instrument.

Research by Strauß *et al.* (2015) on cloud usage in German SMEs has shown that in general, 25% of firms adopt cloud computing, with 20% of those using it in accounting and finance i.e. 5% of their sample. Similarly low usage of cloud computing in accounting and finance was reported by Carcary *et al*. (2013) at 8% of cloud adopters. Thus, in an effort to gather useful data for our study, we chose a purposive sample. Our sample was drawn from a database held by the Irish Centre for Cloud Computing and Commerce (www.ic4.ie). The Centre maintains close contact with Irish firms who have or are considering migrating some or all of their

[1] See for example, https://www.siliconrepublic.com/enterprise/2012/07/19/can-ireland-be-the-european-capital-of-cloud-computing or http://www.theidcc.com/html/ecosystem/cloud_computing.html

functions to the cloud. Thus, we deliberately selected a sample more likely to use cloud-computing in accounting and finance. In June 2014, a predetermined contact within 707 firms was sent an e-mail outlining the purpose of the research study and requesting their participation. A series of further reminder e-mails were sent after two and three weeks respectively, to encourage. The survey was closed after four weeks. A total of 117 valid responses were received, representing a response rate of 17% which is acceptable in comparison to similar recent surveys in the IC research field (see for example, Novas *et al.*, 2012 (17%), Steenkamp and Kashyap, 2010 (10%) and Cleary, 2009 (23%). The majority of respondents were service sector SMEs.

Of the 117 responses received, 43 firms use cloud-based accounting and finance applications. This 37% cloud computing adoption rate in accounting and finance is higher than the 5% reported by Strauß *et al.* (2015) and 8% by Carcary *et al.* (2013). This is to be expected given the purposive sample. While the number of firms adopting cloud-computing for accounting and finance is low in absolute terms, the survey instrument specifically asked respondents about their use of cloud-based applications, and instructed respondents to exclude cloud-based email and file sharing. We can thus be reasonably confident that these respondent firms utilise their cloud-based accounting and finance infrastructure to manage their regular accounting tasks in a similar way to how other firms would use desktop applications. We also queried respondents who did not use cloud-based accounting and finance applications if they use the cloud for other business areas. The responses to this show an approximate three-way split between accounting, sales/customer service and other business processes. This is in contrast to Strauß *et al.* (2015), where 60% of firms used cloud computing for other processes, and 31% for customer relations. Although this study is not directly comparable to Strauß *et al.* (2015), our purposive sample yielded a more even distribution of the uses of cloud computing technologies.

The data collected from our survey was then transferred to SPSS to begin the analysis process; the outputs of which can be seen in Tables I - IV. Data analysis used a Partial Least Squares (PLS) approach, in-keeping with previous IC research (see for example, Bontis and Fitz-enz, 2002; Bontis, 2002, 1998; Cleary, 2015, 2009; Cleary *et al.*, 2007; Do Rosario Cabrita and Landeiro Vaz, 2006; Jardon and Martos, 2012; Mention and Bontis, 2013; Ordonez de Pablos, 2002; Wang and Chang, 2005). Within the context of PLS research, the main objective is the explanation of the amount of variance contained within a particular model setting. Therefore, R^2 values and the statistical significance of relationships among constructs provide an excellent indication as to how well a particular model is performing.

As noted above, this paper is based upon the responses of 43 firms (or 37%) who have adopted cloud-based computing in accounting and finance. As the PLS approach is recommended for the analysis of small datasets of up to 100 cases (Hoyle, 1999), it is therefore appropriate for our purposes. Furthermore, with regard to minimum sample size requirements within PLS, the general rule of thumb (Barclay *et al.*, 1995; Chin, 1997) for a study with "reflective" indicators (i.e. the items/measures/statements which comprise each construct "reflect" or are manifestations of the construct) is ten times the largest number of antecedent constructs (i.e. cloud-based accounting/finance infrastructure, human capital, structural capital and relational capital) leading to an endogenous construct (i.e. business performance). Therefore, the minimum sample size here is 40 (4 antecedent constructs x 10). As this study generated 43 responses, for the purposes of conducting regression analysis the sample size here is acceptable for this exploratory research.

Using a PLS approach, the validity and reliability of the measurement model (constructs and their corresponding items – see Appendix I) must be validated prior to assessing a proposed structural model (i.e. the relationships between the constructs). First, the reliability of each item is statistically assessed – see Table I. Second, the relationship between the item and each construct is reviewed – see Table II. Third, the statistical validity of each construct is assessed – see Table III. And finally, the relationship among constructs is reviewed – see Table IV. The remainder of this section details each step in confirming the validity and reliability of the measurement model. Using PLS, the measurement model is assessed by first investigating individual item (i.e. question/statement) reliability. The normal protocol for items used in previous research is to accept those with loadings of 0.70 or greater (Carmines and Zeller, 1979). As loadings are correlations (i.e. an item's loading squared), this implies that more than 50% of the variance contained within an individual item is shared with the construct (Barclay *et al.*, 1995). Any item that fails to meet this 0.70 loading threshold is generally removed from further statistical analysis, unless a valid reason exists for its retention.

As noted earlier this research is exploratory. Thus, the items used were developed specifically by the researchers and have not been used or tested previously. At such early stages of item development, minimum item loadings of 0.60 or even 0.50 are often deemed acceptable (see for example, Birkinshaw *et al.*, 1995; Chin, 1998; Ford *et al.*, 1986; Hair *et al.*, 1987; Hulland, 1999). However, a 0.70 item loading threshold is adopted here rather than a lower alternative (0.60, 0.50) normally prescribed for exploratory research as using the 0.70 loading level supports a higher degree of statistical validation for subsequent results. Despite our purposive sampling, a relatively low absolute number of respondents use cloud-based accounting and finance applications. Thus, using the higher 0.70 loading level adds statistical strength to our analysis. A small number of items failed to reach the 0.70 loading threshold (see Table I – CloAccFin1, StrCap9, RelCap2 and RelCap6) and were subsequently removed from further statistical testing. The remaining items in each construct were then re-evaluated by examining the corrected item-to-total correlation score (see Table I). All items successfully reached the minimum threshold of 0.35 (Saxe & Weitz, 1982).

It is interesting to note that in relation to one of the items removed from further statistical analysis (i.e. CloAccFin1 – it has limited our ability to customise accounting/finance systems to our needs), the loading level generated was -0.160 (see Table I). This "negative" result indicates that the use of a cloud-based accounting/finance infrastructure within our sample of firms actually enables (and not restricts) these firms to customise their accounting/finance systems to their needs - a finding that is supported by subsequent statistical analysis.

[insert Table 1 here]

A matrix of loadings of cross-loadings was then constructed (see Table II) to test the discriminant validity of each of the remaining items contained within each construct. To do this, the loading of a particular item within its associated construct is compared with its cross-loadings for each of the other constructs. Here, as all of the remaining items had higher loadings with their corresponding constructs when compared to their cross-loadings, it can be concluded that each item has adequate discriminant validity.

[insert Table 2 here]

Having determined the statistical validity of the survey items (as per Tables I and II), we then focused our attention on the appropriateness of the constructs themselves. Consequently, these were tested for both internal consistency and convergent validity (see Table III).

Internal consistency is evaluated using both the Fornell & Larcker (1981) measure and Cronbach's Alpha. All five constructs used in this study easily met the 0.70 threshold for both of these measures. Similarly, with regard to convergent validity, all five constructs met the minimum threshold level (Average Variance Extracted (AVE)) of 0.50 deemed necessary for this test (Fornell & Larcker, 1981).

[insert Table 3 here]

Finally, discriminant validity at the construct level was tested using the Convergent Validity measure as developed by Fornell & Larcker (1981). In this test, the shared variance between any two constructs should be less than the variance extracted by either of the individual constructs (i.e. values along the diagonal of the correlation matrix (the square root of the Average Variance Extracted for each construct) should be greater than the corresponding values in each row or column). As Table IV illustrates this was the outcome here, thereby validating the existence of adequate discriminant validity at the construct level for all five constructs.

[insert Table 4 here]

Having confirmed the statistical validity and reliability of the items and constructs (i.e. the "measurement model") used in this study, the results of the PLS statistical testing performed upon the conceptual model (i.e. the "structural model") can now be analysed. For this task, we used the PLS-Graph version 3.0 software application. This application has been used previously in similar IC based studies (see for example, Bontis and Fitz-enz, 2002; Bontis, 1998; Cleary *et al.*, 2007; Cleary, 2009, 2015; Do Rosario Cabrita and Landeiro Vaz, 2006; Ordonez de Pablos, 2002; Wang and Chang, 2005). The next section reveals our findings.

4. Findings

Before detailing our model results, some general findings of our survey are worthy of brief mention. As noted in Section 3, our purposive sample provided a higher proportion of respondents using a cloud-based accounting and finance infrastructure than noted in previous research (Strauß *et al.* (2015); Carcary *et al.* (2013)). However, even within our sample, it would seem SMEs are somewhat reluctant to adopt a cloud-based accounting and finance infrastructure. Quinn *et al.* (2014) noted security concerns as a key issue. In our sample, 37%

of respondents not using a cloud-based accounting and finance infrastructure cited security and/or privacy as an issue. Lack of time was cited by 14%, lack of expertise by 15% and a perception of no improvement in accounting processes by 13%. Finally, in contrast to Quinn *et al.* (2014), where 36% of non-cloud adopters cited integration as an issue, only 8% of our non-adopters gave this reason. While these findings are not the primary concern of this research, it does suggest that SMEs who are familiar with and/or using cloud computing in general are more likely to adopt it for accounting purposes too.

Let us now turn to our structural model. In plain language, Figure 1 depicts a model which suggests that the use of a cloud-based accounting and finance infrastructure (i.e. the delivery of existing accounting and finance systems via a cloud computing platform) can positively impact upon each of the three components of a firms' IC. This impact on IC can in turn affect business performance. Figure 1 also shows the results from our statistical analysis. On the assertion that the introduction of a cloud-based accounting/finance infrastructure can positively impact upon firms' IC, the result for structural capital, although positive (0.390) is not statistically significant. This is not unexpected, as the basic premise behind the use of cloud computing from an accounting/finance perspective is that while the mechanics of the accounting/finance systems themselves may not have changed their delivery has, with subsequent benefits for other elements of the firm. For example, cloud computing makes accounting information easier to share (see Strauß *et al.*, 2015). This is supported by the fact that the paths between cloud-based accounting/finance infrastructure and both human capital (0.483) and relational capital (0.624) are positive and statistically significant at a p-value < 0.01. Collectively, these three results provide partial support for the suggestion that the implementation of cloud-based accounting/finance infrastructure in Irish SMEs can potentially enhance their IC.

[insert Figure 1 around here]

On the relationships between the three components of IC and subsequent business performance, the beta path coefficient between relational capital and business performance was found to be both positive (0.361) and statistically significant at a p-value < 0.01. A similar positive and statistically significant result was found between structural capital and business performance (0.204), as well as human capital and business performance (0.432) - albeit at p-values < 0.05. Collectively, these results support the ability of Irish-based SMEs to utilise their IC to positively impact upon their subsequent business performance. This particular finding strongly supports previous research (see for example, Sharabati *et al.*, 2010; Novas *et al.*, 2012; Mention and Bontis, 2013) which was conducted in a variety of industry settings and geographic locations. Taken together, all of the results discussed thus far provide support for the assertions made by both Afshari (2014) and Bhadani (2014) who claimed that the use of cloud computing has the potential to positively impact upon their IC and their overall organisational performance.

The results from the conceptual model also reveal that the beta path coefficient between the relational capital construct and the human capital construct while positive (0.207) is not statistically significant. In contrast, the path between the structural capital construct and the human capital construct is both positive (0.293) and statistically significant at a p-value < 0.05. These results suggest that data, information and knowledge obtained from sources including SMEs cloud-based internal accounting and finance systems appear to have a greater influence in supporting employees in carrying out their daily duties than similar information obtained from external sources – see Strauß *et al.* (2015). How exactly this influence is exerted remains uncertain and is therefore worthy of further investigation.

The R^2 values generated by each of the endogenous constructs used in the conceptual model are; structural capital – 15.2%, relational capital – 38.9%, human capital – 64.5% and business performance – 71.3%. The R^2 value of the business performance construct at 71.3% is highly encouraging, as it suggests support for the hypothesis that the use of cloud-based accounting/finance infrastructure in SMEs can positively impact on their subsequent business performance through the prism of their IC. This is so, as within the PLS methodological approach, R^2 values for endogenous constructs (e.g. business performance) provide a measure of the predictive power for a particular conceptual model – i.e. how well a particular model is performing. In this instance, the answer is that the model performs very well, although the exploratory nature of this research coupled with the sample size must be acknowledged. Nevertheless, given the extremely competitive nature of modern business, any development that can potentially offer firms' a trading advantage over their rivals must be seriously considered. Based on this research, it appears that the use of a cloud-based accounting/finance infrastructure represents one possible approach.

5. Concluding comments

Cloud computing offers small and medium-sized firms the possibility of realising benefits such as superior technology, enhanced security, cost savings and more efficient business processes (Marston *et al.*, 2011; Strauß *et al.,* 2015;). Some of these advantages were not previously available to SMEs, due primarily to capital investment limitations. Within the accounting/finance domain, the potential advantages associated with the application of cloud computing technologies would appear to be numerous, culminating with the possibility of improved overall business performance via strengthened IC (Afshari, 2014; Bhadani, 2014).

The results from our exploratory study (see Figure 1) suggest that Irish-based SMEs can potentially enhance their business performance through realising some or all of the potential benefits associated with the implementation and use of a cloud computing based infrastructure in the accounting/finance area. Specifically, the results suggest that each of the three elements of firms' IC can be positively impacted to varying degrees by the use of a cloud-based accounting/finance infrastructure and that all three elements of firms IC (empowered by the use of a cloud-based accounting/finance infrastructure) can directly influence their overall business performance. This latter finding is supported by previous IC based research (see for example, Mention & Bontis, 2013; Novas *et al.*, 2012; Sharabati *et al.*, 2010).

As SMEs increasingly trade on a global basis, where competitiveness and cost control are of paramount importance to both survival and prosperity, the adoption and subsequent realisation of benefits from technologies such as cloud computing are to be welcomed. Indeed, such are the possible advantages associated with cloud computing that it seems likely that SMEs who decide against pursuing it may quickly and irrevocably find themselves at a competitive disadvantage to those that do. The fact that it has been suggested that Irish-based SMEs currently experience significantly lower labour productivity than other sectors of the Irish economy (European Commission, 2013), indicates that the adoption of cloud computing and other advanced technologies is to be strongly encouraged here. By doing so, it is hoped that Irish-based SMEs can transform their accounting/finance functions to become a key element of their strategic architecture and not to remain solely back-office orientated (Young, 2010) as has been a recurring criticism in the past. However, to reach this plateau, accountants will need to be both reassured and satisfied that elements of the accounting/finance function (and the data underpinning it) within their respective firms are ready and able to migrate to the cloud. It seems reasonable to conclude that much work remains to be done in this regard.

There are of course limitations associated with this study. First, as this research project was conducted solely within the confines of Irish-based SMEs, the results reported here are not generalizable to other sectors of the Irish economy, or to other economies. Second, by using a survey instrument to collect data, the findings are general in nature and thus, do not explain unique organisational nuances associated with the use of a cloud-based accounting/finance infrastructure. Third, although great care has been taken in this exploratory research, the items used in this study were developed specifically for it and thus, have not been previously used elsewhere. Consequently, these items need further testing in other research settings so as to confirm their statistical validity. The exploratory nature of the study also ensures that we cannot offer generalizations.

Based upon the findings, there are several avenues available for further research. First, as the use of cloud computing is a relatively new concept for many organisations; research in this area is limited. Therefore, from an accounting/finance perspective, a possible future avenue for research would be to conduct some in-depth case studies to determine how exactly Irish (or other) SMEs are using their cloud-based accounting/finance infrastructure to enhance their overall business performance. In other words, studies which take the exploratory nature of this study to a more in-depth level are to be welcomed. Second, the items and constructs used in this study could be replicated in a variety of other organisational sectors (e.g. pharmaceutical, IT, financial services) to determine whether the results generated here are applicable elsewhere. Third, our cloud accounting/finance infrastructure survey items (see Appendix I) are essentially reflective of underlying organisational routines. More in-depth studies of such routines (see for example, Pentland *et al.*, 2010) in various organisational settings would provide useful and more comprehensive insights on how cloud technologies affect accounting within SMEs, and other organisation types. Finally, studies using larger samples would be welcomed to expand the exploratory nature of this study.

Bibliography

Afshari, M. (2014), "Cloud-Based Knowledge Management", CloudTweaks, available at: http://cloudtweaks.com/2014/06/cloud-based-knowledge-management/ (accessed 25 October 2014).

Argilés, J. M. and Slof, E. J. (2003), "The use of financial accounting information and firm performance: an empirical quantification for farms", *Accounting and Business Research,* Vol. 33, No. 4, pp. 251-273.

Barclay, D., Higgins, C. and Thompson, R. (1995), "The Partial Least Squares (PLS) Approach to Causal Modeling: Personal Computer Adoption and Use as an Illustration", *Technology Studies*, Vol. 2, No. 2, pp. 285-309.

Bhadani, R. (2014), "A New Dimension in HRM: Cloud Computing", *International Journal of Business and Management Invention*" Vol. 3, No.7, pp. 13-15.

Birkinshaw, J., Morrison, A. and Hulland, J. (1995), "Structural and competitive determinants of a global integration strategy", *Strategic Management Journal*, Vol. 16, November, pp. 637-655.

Bontis, N. and Fitz-enz, J. (2002), "Intellectual Capital ROI: a causal map of human capital antecedents and consequents", *Journal of Intellectual Capital*, Vol. 3, No. 3, pp. 223-247.

Bontis, N. (2002), "Human Capital ROI: Written Report", available at: http://www.business.mcmaster.ca/mktg/nbontis/ic/publications/BontisHC.pdf (accessed 22 October 2014).

Bontis, N., Chua Chong Keow, W. and Richardson, S. (2000), "Intellectual Capital and business performance in Malaysian industries", *Journal of Intellectual Capital*, Vol. 1, No. 1, pp.85-100.

Bontis, N. (1998), "Intellectual capital: an exploratory study that develops measures and models", *Management Decision*, Vol. 36, No. 2, pp. 63-76.

Booth, R. (1998), "The measurement of intellectual capital", *Management Accounting,* Vol. 76, No. 10, pp. 26-28.

Burns, J. and Scapens, R. (2000), Conceptualising management accounting change: an institutional framework, *Management Accounting Research*, Vol. 11, No. 1, pp. 3-25.

Burns, J., Ezzamel, M. and Scapens, R. (1999), "Management accounting change in the UK", Management Accounting, Vol. 77, No. 3, pp. 28-30.

Cabrita, M. R. and Bontis, N. (2008), "Intellectual capital and business performance in the Portugese banking industry", *International Journal of Technology Management*, Vol. 43, No. 1–3, pp. 212–237.

Carmines, E. G. and Zeller, R. A. (1979), *Reliability and validity assessment*, Sage Publications, California, USA.

Carcary, M., Doherty, E. and Conway G (2013) "Understanding and Supporting Cloud Computing Adoption in Irish Small and Medium-Sized Enterprises", White Paper, Innovation Value Institute, National University of Ireland, available at: http://ivi.nuim.ie/sites/ivi.nuim.ie/files/publications/IVI%20Exec%20Briefing%20-%20Cloud%20Adoption%20in%20SME%20Nov13%20v1%200.pdf (accessed 13 November 2014).

Chin, W. (1998), "The partial least squares approach to structural equation modeling" in *Modern Methods for Business Research*, Marcoulides, G. A (Eds.), pp. 295-366, Lawrence Erlbaum Associates, New Jersey, USA.

Chin, W. (1997), "Overview of the PLS Method", available at: http://disc-nt.cba.uh.edu/chin/PLSINTRO.HTM (accessed 15 September 2014).

Clarke, M., Seng, D. and Whiting, R. H. (2011), "Intellectual capital and firm performance in Australia", *Journal of Intellectual Capital*, Vol. 12, No. 4, pp. 505-530.

Cleary, P. (2015), "An empirical investigation of theimpact of Management Accounting on Structural Capital and Business Performance", *Journal of Intellectual Capital*, Vol. 16, No. 3, 566-586.

Cleary, P. (2009), "Exploring the Relationship between Management Accounting & Structural Capital in a Knowledge Intensive Sector", *Journal of Intellectual Capital*, Vol. 10, No. 1, pp. 37-52.

Cleary, P., Kennedy, T., O'Donnell, D., O'Regan, P. and Bontis, N. (2007), "Positioning Management Accounting on the Intellectual Capital Agenda", *International Journal of Accounting, Auditing and Performance Evaluation*, Vol. 4, No. 4-5, pp. 336-359.

Connolly, T. (2010), "Demystifying Cloud Computing", Finance Leaders Articles, Chartered Accountants Ireland, March, available at: http://archive-ie.com/page/4059548/2014-06-02/http://www.charteredaccountants.ie/en/Members/Technical/Finance-Leaders-Articles/Demystifying-Cloud-Computing---Tony-Connolly-FCA/ (accessed 22 October 2014).

Cooper, T. (2011), "Cloud computing: benefits versus risks", Insight, Chartered Institute of Management Accountants, July, available at: http://www.cimaglobal.com/Thought-leadership/Newsletters/Insight-e-magazine/Insight-2011/Insight-July-2011/Cloud-computing/ (accessed 22 October 2014).

Davenport, T.H. 2000, *Mission Critical: Realising the Promise of Enterprise Systems,* Boston: Harvard Business School Press.

Davila, A. and Foster, G., (2007), "Management control systems in early-stage startup companies", *The Accounting Review,* Vol. 82, No. 4, pp. 907-937.

Do Rosario Cabrita, M. and Landeiro Vaz, J. (2006), "Intellectual capital and value creation: evidence from the Portugese Banking industry", *The Electronic Journal of Knowledge Management*, Vol. 4, No. 1, pp. 11-20.

Drew, J. (2012), "Heads in the Cloud: Part 2", *Journal of Accountancy,* March, pp. 34-37.

Du, H. and Cong, Yu. (2010), "Cloud Computing, Accounting, Auditing, and Beyond", *The CPA Journal,* October, pp. 66-70.

Edvinsson, L. (2013), "IC 21: reflections from 21 years of IC practice and theory", *Journal of Intellectual Capital,* Vol. 14, No. 1, pp. 163-172.

Edwards, J. S., Collier, P. M. and Shaw, D. (2005), *Knowledge management and its impact on the management accountant*, Chartered Institute of Management Accountants (CIMA) Research Report, London, England, available at: http://www.cimaglobal.com/Documents/ImportedDocuments/tech_resrep_knowledge_management_and_its_impact_on_the_management_accountant_2005.pdf (accessed 22 October 2014).

European Commission (2013), *Enterprise and Industry – 2013 SBA Fact Sheet Ireland*, available at: http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2013/ireland_en.pdf (accessed 1 December 2014).

Ford, J. K., MacCallum, R. C. and Tait, M. (1986), "The application of exploratory factor analysis in applied psychology: a critical review and analysis", *Personnel Psychology*, Vol. 39, No. 2, pp. 291-314.

Fornell, C. and Larcker, V. F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18, No. 1, p. 39-50.

Garcia-Ayuso, M. (2003), "Intangibles – Lessons from the past and a look into the future", *Journal of Intellectual Capital*, Vol. 4, No. 4, pp. 597-604.

Gill, R. (2011), "Why Cloud Computing Matters to Finance", *Strategic Finance*, January, pp. 43-47.

Giovannoni, E., Maraghini, P. and Riccaboni, A. (2011), "Transmitting Knowledge Across Generations: The Role of Management Accounting Practices", *Family Business Review,* Vol. 24, No. 2, pp. 126-150.

Granlund, M. and Malmi, T. (2002), "Moderate impact of ERPS on management accounting: a lag or permanent outcome?", *Management Accounting Research,* Vol. 13, No.3, pp. 299-321.

Grant, R. M. (1997), "Strategy at the leading edge. The knowledge-based view of the firm: implications for management practice", *Long Range Planning*, Vol. 30, No. 3, pp. 450-454.

Hair, J., Rolph, A. and Tatham, R. (1987), *Multivariate data analysis*, Macmillan, New York, USA.

Hiebl, M. R. W., (2013), "Management accounting in the family business: tipping the balance for survival", *Journal of Business Strategy*, Vol. 34, No. 6, pp. 19-25.

Hiebl, M. R. W., Feldbauer-Durstmüller, B., Duller, C. and Neubauer, H. (2012), "Institutionalisation of Management Accounting in Family Businesses: Empirical Evidence from Austria and Germany", *Journal of Enterprising Culture,* Vol. 20, No. 4, pp. 405-436.

Howlett, D. (2011), "The bright future for cloud accounting", Insight, Chartered Institute of Management Accountants, June, available at: http://www.cimaglobal.com/Thought-leadership/Newsletters/Insight-e-magazine/Insight-2011/Insight-July-2011/The-bright-future-for-cloud-accounting/ (accessed 22 October 2014).

Hoyle, R. H. (1999), Statistical strategies for small sample research, Sage Publications, Thousand Oaks, California, USA.

Hulland, J. (1999), "Use of Partial Least Squares (PLS) in strategic management research: a review of four recent studies", *Strategic Management Journal*, Vol. 20, No. 2, pp. 195-204.

Jardon, C. M. F. and Martos, M. S. (2012), "Intellectual capital as competitive advantage in emerging clusters in Latin America", *Journal of Intellectual Capital*, Vol. 13, No. 4, pp. 462-481.

Jardon, C. M. F. and Martos, M. S. (2009), "Intellectual capital and performance in wood industries of Argentina", *Journal of Intellectual Capital*, Vol. 10, No.4, pp. 600–616.

Kristandl, G. and Quinn, M. (2012) "Old wine in new bottles? A preliminary exploration of management accounting in cloud business models", European Accounting Association annual conference, Ljubljana, May 9-11.

Lawless, M., McCann, F. and McIndoe-Calder, T. (2012) "SMEs in Ireland: Stylised facts from the real economy and credit market", Central Bank of Ireland Quarterly Bulletin, 02, April, pp. 99-123, available at: http://www.centralbank.ie/publications/Documents/SMEs%20in%20Ireland%20Stylised%20facts%20from%20the%20real%20economy%20and%20credit%20market.pdf (accessed 12 November 2014).

Lynn, B. E. (1999), "The Management of Intellectual Capital: The Issues and the Practice", Management Accounting Issues Paper, Vol. 16, The Society of Management Accountants of Canada, pp. 1-62.

Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J. and Ghalsasi, A. (2011), "Cloud computing - the business perspective", Decision Support Systems, Vol. 51, No. 1, pp. 176–189.

Mention, A. L. and Bontis, N. (2013), "Intellectual capital and performance within the banking sector of Luxembourg and Belgium", *Journal of Intellectual Capital*, Vol. 14, No. 2, pp. 286-309.

Mongan, K. (2011), "Cloud Computing – The Storm Is Coming", *Accountancy Ireland*, Vol. 43, No. 3, pp. 58-59.

Mouritsen, J. (2006), “Problematising intellectual capital research: ostensive verses performative IC”, *Accounting, Auditing & Accountability Journal*, Vol. 19, No. 6, pp. 820-841.

Murphy, K. and Simon, S. (2002), "Intangible benefits valuation in ERP projects", *Information Systems Journal,* Vol. 12, No. 4, pp. 301-320.

NIST (2011), “The NIST definition of cloud computing”, Special Publication 800-145, National Institute of Standards and Technology, Maryland.

Novas, J. C., Sousa, A. and Alves, M. C. (2012), “On the Relations Between Management Accounting Systems and Intellectual Capital. Evidence for Portugese Companies”, CEFAGE UE working paper series, available at: http://www.cefage.uevora.pt/en/producao_cientifica/working_papers_serie_cefage_ue/on_the_relations_between_management_accounting_systems_and_intellectual_capital_evidence_for_portuguese_companies (accessed 22 October 2014).

Ordonez de Pablos, P. (2002), “Direct and indirect effects of Intellectual Capital on organizational competitive advantage: empirical evidence”, paper presented at “The Transparent Enterprise. The Value of Intangibles” conference, 25-26 November, Madrid Spain.

Paul, F. (2010), “Why cloud computing matters to small biz”, Forbes, available at: http://www.forbes.com/2010/01/21/cloud-computing-3tera-entrepreneurs-technology-informationweek.html (accessed 22 October 2014).

Pentland, B. T., Haerem, T. and Hillison, D. (2010), “Comparing organizational routines as recurrent patterns of action”, *Organization Studies,* Vol. 31, No.7, pp. 917-940.

Perren, L. and Grant, P. (2000), “The evolution of management accounting routines in small businesses: a social construction perspective”, *Management Accounting Research*, Vol. 11, pp. 391-411.

Quinn, M. (2014), Stability and change in management accounting over time—A century or so of evidence from Guinness, *Management Accounting Research*, Vol. 25, No. 1, pp. 76-92.

Quinn, M. (2011), Routines in management accounting research: further exploration, *Journal of Accounting & Organizational Change*, Vol. 7, No. 4, pp. 337-357.

Quinn, M., Strauß, E. and Kristandl, G. (2014), “The effects of cloud technology on management accounting and decision-making”, *Financial Management*, August, pp. 54-55.

Roberts, H. (2003), “Management Accounting and the Knowledge Production Process”, in Bhimani, A. (Ed.), *Management Accounting in the Digital Economy,* Oxford University Press, New York, USA, pp. 260-283.

Robinson, L. (2011), “The Cloud: Bringing Permanent Changes to Business”, *Financial Executive*, Vol. 27, No. 10, pp. 71-72.

Russel, K. and Siegel, G. 1999, "Counting more, counting less", Strategic Finance, Vol. 81, No. 3, pp. 38-44.

Sandino, T. (2007), “Introducing the first management control systems: evidence from the retail sector”, *The Accounting Review,* Vol. 82, No. 1, pp. 265-293.

Saxe, R. and Weitz, B. (1982), “The SOCO scale: a measure of the customer orientation of salespeople”, *Journal of Marketing Research,* Vol. 19, No. 3, pp. 343-351.

Scapens, R., Ezzamel, M., Burns, J. and Baldvinsdottir, G. (2003), *The Future Direction of UK Management Accounting*, CIMA, London.

Shang, S. & Seddon, P.B. (2002), "Assessing and managing the benefits of enterprise systems: the business manager’s perspective", *Information Systems Journal,* Vol. 12, No. 4, pp. 271-299.

Sharabati, A. A., Jawad, S. N. and Bontis, N. (2010), “Intellectual capital and business performance in the pharmaceutical sector of Jordan”, *Management Decision*, Vol. 48, No. 1, pp. 105-131.

Sofian, S., Tayles, M. E. and Pike, R. H. (2004), “Intellectual Capital: An Evolutionary Change in Management Accounting Practices”, paper presented at the 4th Asia Pacific Interdisciplinary Research in Accounting Conference, 4-6 July, Singapore Management University, Singapore.

Steenkamp, N. and Kashyap, V. (2010), “Importance and contribution of intangible assets: SME managers’ perceptions”, *Journal of Intellectual Capital,* Vol. 11, No. 3, pp.368-390.

Strauβ, E., Kristandl, G. & Quinn M. (2014), *The effects of cloud technology on management accounting and decision making*, CIMA Research Executive Summary Series, 10(6) available at: http://www.cimaglobal.com/Documents/Thought_leadership_docs/Management%20and%20financial%20accounting/effects-of-cloud-technology-on-management-accounting.pdf (accessed 12 January 2015).

Tayles, M., Bramley, A., Adshead, N. and Farr, J. (2002), “Dealing with the management of intellectual capital – The potential role of strategic management accounting”, *Accounting, Auditing & Accountability Journal*, Vol. 15, No. 2, pp. 251-267.

Wang, W. Y. and Chang, C. (2005), “Intellectual capital and performance in causal models – Evidence from the information technology industry in Taiwan”, *Journal of Intellectual Capital,* Vol. 6, No. 2, pp. 222-236.

Young, R. (2010), “Cloud computing could lead to more adaptive finance function”, Insight, Chartered Institute of Management Accountants, December, available at:

http://www.cimaglobal.com/Thought-leadership/Newsletters/Insight-e-magazine/Insight-2010/Insight-December-2010/Cloud-computing-could-lead-to-more-adaptive-finance-function/ (accessed 22 October 2014).

Appendix I

Survey Items

Cloud-based accounting/finance infrastructure

The following statements relate to your perception of the use of cloud-based accounting/finance applications by your organisation in general. Please rate each statement on a scale of strongly disagree to strongly agree.

CloAccFin1	It has limited our ability to customise accounting/finance systems to our needs
CloAccFin2	It has made our daily accounting tasks more standardised
CloAccFin3	It has simplified our accounting processes
CloAccFin4	It has made it easier for any accounting staff member to perform any accounting task
CloAccFin5	It has made it easier to communicate accounting procedures to new accounting/finance staff
CloAccFin6	It has made it easier to document accounting procedures
CloAccFin7	It has made it easier to adapt accounting procedures
CloAccFin8	It has made it easier to replicate accounting/finance systems to other parts/branches of the organisation

Human Capital

The following statements relate to your perception of the use of cloud-based accounting/finance applications within your organisation has helped your employees (i.e. human capital). Please rate each statement on a scale of strongly disagree to strongly agree.

It has enhanced …

HumCap1	The ability of accounting/finance employees to collaborate within the organisation
HumCap2	Management decision-making
HumCap3	The ability of accounting/finance staff to generate knowledge
HumCap4	The ability to transfer organisation knowledge within accounting/finance
HumCap5	The motivation of accounting/finance employees
HumCap6	The retention of accounting/finance employees
HumCap7	The ability of non-accounting staff to utilise accounting/finance knowledge
HumCap8	The feasibility of cross-functional teamwork across the organisation
HumCap9	The willingness of accounting and finance staff to embrace further use of cloud technology

Structural Capital

The following statements relate to your perception of the use of cloud-based accounting/finance applications by your organisation from a structural capital perspective (i.e. systems, processes, etc…). Please rate each statement on a scale of strongly disagree to strongly agree.

It has enhanced our ability to …

StrCap1	Acquire relevant data/knowledge
StrCap2	Acquire relevant data/knowledge from multiple sources
StrCap3	Access relevant data/knowledge for decision-making
StrCap4	Access relevant data/knowledge for planning/control
StrCap5	Share relevant data/knowledge for decision-making
StrCap6	Share relevant data/knowledge for planning/control
StrCap7	Retain relevant data/knowledge
StrCap8	Use accounting/finance systems within the organisation
StrCap9	Upgrade accounting/finance systems

Relational Capital

The following statements relate to your perception of the use of cloud-based accounting/finance applications helps you/your organisation interact with others (i.e. relational capital). Please rate each statement on a scale of strongly disagree to strongly agree.

It has enhanced our ability to …

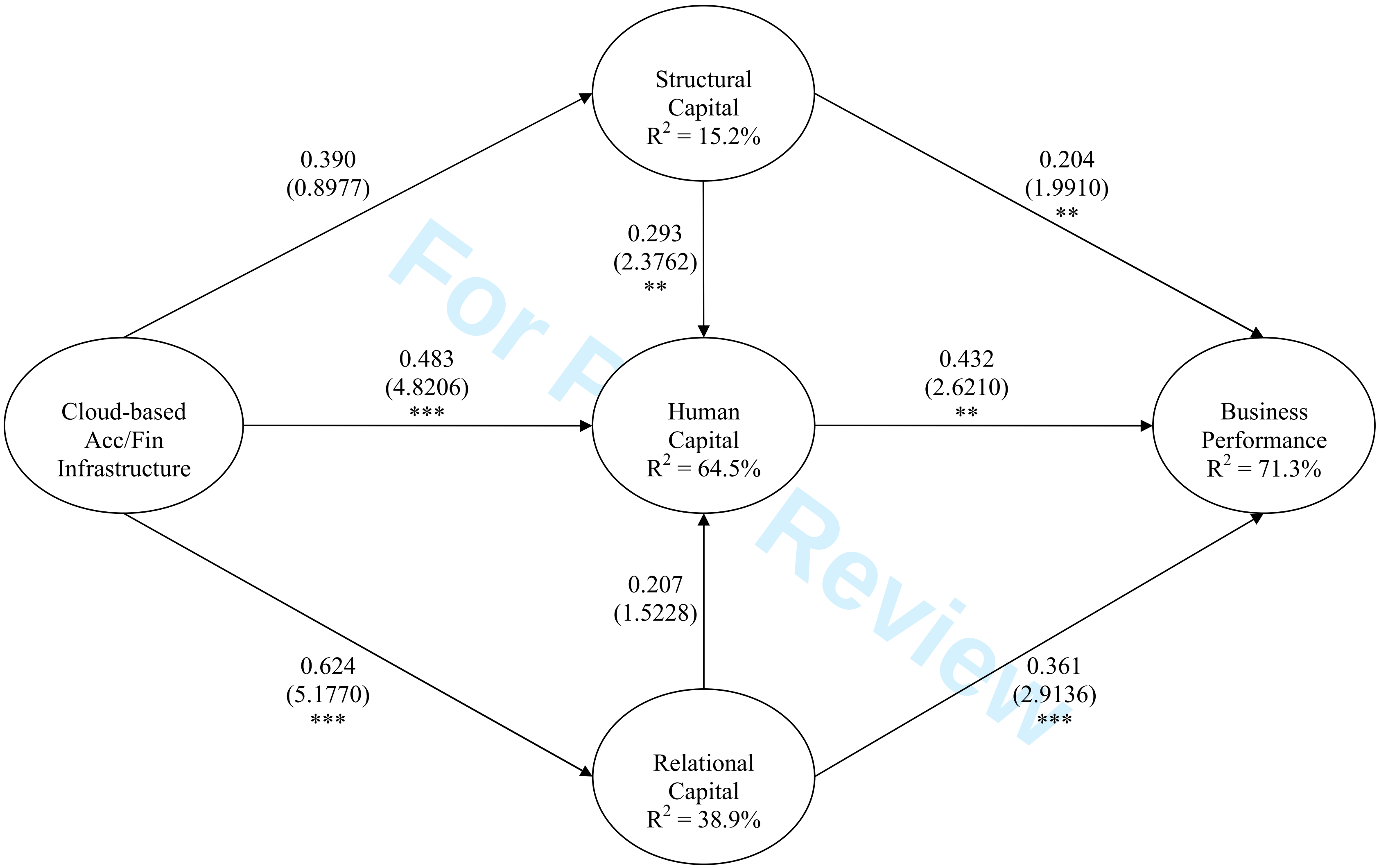
RelCap1	Acquire and use information about customers
RelCap2	Acquire and use information about suppliers
RelCap3	Acquire and use information about competitors
RelCap4	Meet current customer and market needs
RelCap5	Predict future customer and market trends
RelCap6	Interact with our employees
RelCap7	Interact with our shareholders
RelCap8	Interact with relevant Government agencies (e.g. The Office of the Revenue Commissioners)
RelCap9	Interact with financial institutions (e.g. banks)

Business Performance

The following statements relate to your perception of the use of cloud-based accounting/finance applications within your organisation has improved performance. Please rate each statement on a scale of strongly disagree to strongly agree.

The use of cloud-based accounting/finance systems has allowed us to …

BusPer1	Improve our overall business performance
BusPer2	Outperform our main trading rivals
BusPer3	Attain a competitive advantage
BusPer4	Enhance our corporate reputation
BusPer5	Enhance shareholder/business value
BusPer6	Enhance our strategic decision-making



Note: Top number is path, *t*-values in brackets, *** significant at *p*-value < 0.01, ** significant at *p*-value <0.05

Figure 1 – The impact of cloud-based accounting/finance infrastructure on IC and business performance.

Tables

Cloud Accounting/Finance	Mean	SD	Loading Level (0.70)	Item to Construct (0.35)
CloAccFin1	2.81	1.052	-0.160	**removed**
CloAccFin2	3.72	0.701	0.825	0.751
CloAccFin3	3.74	0.902	0.807	0.741
CloAccFin4	3.70	0.914	0.751	0.677
CloAccFin5	3.60	0.849	0.893	0.853
CloAccFin6	3.30	0.832	0.852	0.788
CloAccFin7	3.33	0.837	0.831	0.748
CloAccFin8	3.72	0.854	0.836	0.763
Human Capital				
HumCap1	3.84	0.721	0.794	0.741
HumCap2	3.91	0.750	0.787	0.733
HumCap3	3.81	0.764	0.808	0.753
HumCap4	3.74	0.693	0.825	0.771
HumCap5	3.07	0.704	0.851	0.802
HumCap6	3.05	0.688	0.843	0.793
HumCap7	3.70	0.832	0.844	0.794
HumCap8	3.98	0.636	0.832	0.785
HumCap9	3.77	0.718	0.851	0.804
Structural Capital				
StrCap1	3.65	0.923	0.767	0.716
StrCap2	3.70	0.939	0.810	0.754
StrCap3	3.93	0.856	0.895	0.854
StrCap4	3.84	0.898	0.884	0.847
StrCap5	3.81	0.932	0.894	0.858
StrCap6	3.84	0.924	0.886	0.851
StrCap7	3.74	0.928	0.810	0.779
StrCap8	3.93	0.910	0.820	0.734
StrCap9	3.91	0.947	0.669	**removed**
Relational Capital				
RelCap1	3.74	0.902	0.719	0.573
RelCap2	3.72	0.908	0.643	**removed**
RelCap3	3.02	0.913	0.843	0.774
RelCap4	3.72	0.797	0.738	0.627
RelCap5	3.21	0.861	0.735	0.623
RelCap6	3.21	0.861	0.594	**removed**
RelCap7	3.00	0.845	0.842	0.755
RelCap8	3.30	0.989	0.780	0.730
RelCap9	3.09	0.971	0.703	0.668
Business Performance				
BusPer1	3.91	0.750	0.823	0.747
BusPer2	3.19	0.764	0.921	0.877
BusPer3	3.28	0.854	0.912	0.861
BusPer4	3.19	0.906	0.891	0.838
BusPer5	3.14	0.861	0.802	0.723
BusPer6	3.88	0.731	0.867	0.805

Table I: Item Statistics

	CloAccFin	HumCap	StrCap	RelCap	BusPer
CloAccFin2	**0.824**	0.628	0.328	0.593	0.567
CloAccFin3	**0.804**	0.591	0.425	0.468	0.479
CloAccFin4	**0.750**	0.561	0.337	0.479	0.494
CloAccFin5	**0.896**	0.600	0.400	0.565	0.519
CloAccFin6	**0.856**	0.560	0.219	0.426	0.473
CloAccFin7	**0.830**	0.579	0.242	0.500	0.469
CloAccFin8	**0.838**	0.634	0.264	0.520	0.568
HumCap1	0.645	**0.794**	0.451	0.510	0.723
HumCap2	0.608	**0.787**	0.641	0.587	0.752
HumCap3	0.482	**0.808**	0.536	0.525	0.614
HumCap4	0.627	**0.825**	0.400	0.581	0.663
HumCap5	0.680	**0.851**	0.431	0.561	0.640
HumCap6	0.633	**0.843**	0.432	0.602	0.667
HumCap7	0.623	**0.844**	0.413	0.295	0.464
HumCap8	0.574	**0.832**	0.473	0.408	0.614
HumCap9	0.447	**0.851**	0.323	0.404	0.471
StrCap1	0.360	0.437	**0.771**	0.360	0.459
StrCap2	0.407	0.476	**0.804**	0.426	0.503
StrCap3	0.308	0.469	**0.898**	0.335	0.447
StrCap4	0.320	0.433	**0.893**	0.299	0.428
StrCap5	0.354	0.556	**0.900**	0.360	0.490
StrCap6	0.323	0.524	**0.895**	0.330	0.521
StrCap7	0.238	0.396	**0.833**	0.279	0.457
StrCap8	0.290	0.438	**0.796**	0.287	0.650
RelCap1	0.397	0.454	0.257	**0.681**	0.488
RelCap3	0.448	0.429	0.335	**0.853**	0.558
RelCap4	0.423	0.435	0.447	**0.728**	0.576
RelCap5	0.522	0.588	0.263	**0.724**	0.554
RelCap7	0.579	0.559	0.191	**0.834**	0.503
RelCap8	0.555	0.474	0.410	**0.812**	0.661
RelCap9	0.378	0.316	0.225	**0.765**	0.465
BusPer1	0.430	0.555	0.606	0.587	**0.823**
BusPer2	0.581	0.667	0.475	0.557	**0.921**
BusPer3	0.487	0.626	0.446	0.639	**0.912**
BusPer4	0.528	0.663	0.420	0.599	**0.891**
BusPer5	0.520	0.654	0.502	0.623	**0.802**
BusPer6	0.660	0.757	0.589	0.669	**0.867**

Table II: Matrix of Loadings and Cross-Loadings

	Internal Consistency		Convergent Validity
	Alpha (0.70)	Fornell & Larcker (0.70)	Fornell & Larcker (0.50)
CloAccFin	0.922	0.9390	0.6878
HumCap	0.941	0.9509	0.6830
StrCap	0.944	0.9542	0.7231
RelCap	0.886	0.9119	0.5980
BusPer	0.934	0.9493	0.7577

Table III: Internal Consistency & Convergent Validity

	CloAccFin	HumCap	StrCap	RelCap	BusPer
CloAccFin	**0.829**				
HumCap	0.716	**0.826**			
StrCap	0.386	0.553	**0.850**		
RelCap	0.608	0.597	0.395	**0.773**	
BusPer	0.612	0.751	0.581	0.706	**0.870**

Table IV: Discriminant Validity – Correlation of Constructs

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