Firms' Information System Characteristics and Management Accounting Adaptability

Introduction

Management accounting provides management with much critical, useful, and needed information, but there is evidence that it can adversely affect performance in the absence of fit (Melnyk, Bititci, Platts, Tobias, & Andersen, 2013). In line with this view, contingency theory suggests that management accounting practices in organizations should evolve with changing idiosyncratic circumstances that are internal and external to the firm (Brignall, 1997; T. Burns & Stalker, 1961; Lawrence & Lorsch, 1986). For example, Hofstede (1967), an early adopter of this theory, explains the functioning of the budgeting system through economic, technological, and sociological factors. Thus, management accounting change is known to be associated with global competition, changes in manufacturing technology (Innes & Mitchell, 1990), information technology (Waweru, Hoque, & Uliana, 2004), the performance gap (Jun Lin & Yu, 2002), organizational structure (Abernethy & Bouwens, 2005; Cavalluzzo & Ittner, 2004), top management support (Cavalluzzo & Ittner, 2004), the influence of government (Lapsley & Wright, 2004), and strategy (Baines & Langfield-Smith, 2003; Fullerton, Kennedy, & Widener, 2012).

As organizations are required to *adapt* to their environments (Boisot & Child, 1999, p. 1), the ability of management accounting to change over time, which I refer to as *adaptability*, is critical to sustain management accounting fit. This may be challenging as research found that, among others, the lack of adequate accounting skills, new shareholders, fear of change, and lack of communication between management and staff hinder change (J. Burns & Scapens, 2000; Hopwood, 1990; Innes & Mitchell, 1990). Furthermore, although computing resources are traditionally seen as facilitators of change (Innes & Mitchell, 1990), it is suggested that integrated information systems (IIS) lead to

technological embeddedness (Volkoff, Strong, & Elmes, 2007) and management accounting stability (Davenport, 1998; Granlund & Malmi, 2002; Rom & Rohde, 2007).

Evidence suggests that certain characteristics of information systems are more conducive to change. For example, Krumwiede (1998) suggests that organizations with higher quality information systems as in the case of IIS may be able to implement advanced measurement systems such as Activity Based Costing more easily than organizations with less sophisticated information systems because measurement costs are lower. Similarly, a number of other studies report that data quality and availability impede the development of new management accounting systems (Cavalluzzo & Ittner, 2004; Gates, 1999; Ittner & Larcker, 1998; Shields, 1995). Thus, the literature argues that information systems seem to both, support and inhibit change. It is this particular issue that I focus on in this paper and that drives the research question:

What information system characteristics affect management accounting adaptability?

The main purpose of this paper is to explore what factors pertaining to the IS of an organization explain the degree to which management accounting is adaptable. I also examine whether management accounting adaptability (MAA) is a predictor of management accounting effectiveness (MAE).

This study makes a number of contributions to the management accounting change, innovation, and accounting information systems literature. First, this study identifies specific factors relating to information systems that may act as facilitators of management accounting change (Innes & Mitchell, 1990; Taipaleenmaki & Ikaheimo, 2011). Second, I conceptualize and focus on MAA, which is a dynamic construct that measures the ability to make changes to management accounting practices when required. Finally, I study the relation between MAA and MAE.

IIS and Management Accounting

Support for management accounting is provided by solutions, such as Enterprise Resource Planning Systems (ERPS) and budgeting software (Granlund & Malmi, 2002; Rom & Rohde, 2007). ERPS integrate organizational data and provide easy and fast access to operational data, which in turn affect the ability of management accounting to provide managerially relevant and usable information (R. Cooper & Kaplan, 1998; Davenport, 1998). ERPS are also known as IIS because the

software itself or when it is used in conjunction with other software (e.g., business intelligence solutions) is *integrated* in the sense that data are stored in one place and computers can communicate with one another through a shared network (Rom & Rohde, 2007).

Research on IIS began in the late 90's and primarily focused on the effects of such systems in terms of stock-market reactions (e.g. Ajit, Donker, & Patnaik, 2014; Hayes, Hunton, & Reck, 2001), as well as organizational performance (e.g. Hunton, Lippincott, & Reck, 2003; A.I. Nicolaou, 2004; A.I. Nicolaou & Bhattacharya, 2006; Velcu, 2007). A number of researchers have also looked at the relation between IIS and management accounting and control (e.g. Chapman & Kihn, 2009; Granlund & Malmi, 2002; Rom & Rohde, 2007; Scapens & Jazayeri, 2003; Wagner, Moll, & Newell, 2011). Often, this relationship is considered unidirectional (i.e., that IIS impacts management accounting, as difficulties of changing ERPS forces companies to work with initial configurations and failures (Davenport, 1998; Dechow & Mouritsen, 2005)). This might suggest that the adoption of new management accounting techniques would become difficult once an information system is in place. On the other hand Rom and Rohde (2007) claim that there may be a bidirectional relationship between IIS and management accounting as users can reconfigure the systems incrementally, leading to significant changes over time. Quattrone and Hopper (2006) illustrate a case where such reconfiguration last for four years, leading to a continuous state of 'drift'. Wagner et al. (2011) also report on a post-roll-out modification but, in this case, the ERPS is reconfigured to match the functionality of the legacy systems for its grant accounting module. Overall, research focusing on the adoption of IIS finds that ERPS implementation has no significant effect on management accounting techniques (Scapens & Jazayeri, 2003). In contrast, it is suggested that ERPS might have a stabilizing effect on management accounting practice (Granlund & Malmi, 2002; Rom & Rohde, 2007).

Despite the advent of IIS and its profound impact on the way processes are executed, Granlund and Malmi (2002) report that companies continue to use separate spread-sheets or software for Balanced Scorecards (Kaplan & Norton, 1992) and Activity Based Costing (Robin Cooper & Kaplan, 1991). These software programs are more user-friendly and flexible with regards to analysis and reporting (Granlund and Malmi, 2002). ERPS have been evolving since their inception in the light of the developments in new software deployment paradigms, such as Service-Oriented Architecture, and advancements in business analytics. However, the same question remains: once an IIS is in place, how does it impact MAA, (i.e., to what extent does it affect the ability to change existing management accounting practices or does it enforce the status quo)? Note that I am not arguing whether information technology has an impact on management accounting in a "one-off" sense, my

intention is to explore to what extent the information system facilitates or impedes management accounting from evolving.

Hypotheses Development

Interest in management accounting change and innovation accelerated as a result of the relevance lost debate (Johnson & Kaplan, 1987) and subsequent reports on varying degrees of adoption rates of advanced management accounting practices across organizations and industries (e.g. Baines & Langfield-Smith, 2003; Fullerton & McWatters, 2004; Krumwiede, 1998). Management accounting change is conceptualized in a number of studies using different theories, including contingency (e.g. Langfield-Smith, 1997; Melnyk et al., 2013; Sisaye & Birnberg, 2010), institutional (J. Burns & Scapens, 2000), and social-constructivist (Quattrone & Hopper, 2001), as well as actor-network-theory (Briers & Chua, 2001, p. 239).

As noted previously, this study does not focus on change per se (i.e., what factors lead to management accounting change or innovation (see e.g., Abernethy & Bouwens, 2005; Baines & Langfield-Smith, 2003; Fullerton et al., 2012; Waweru et al., 2004)) as change is not the end, but instead views the ability to change, that is 'adaptability,' as an important capability. I use the term adaptability as it goes beyond the traditional view of change (i.e., the transition from State A to State B (Quattrone & Hopper, 2001)). Instead, I conceptualize adaptability as a capability that allows management accounting to change on an ongoing basis when required. The term adaptability is also more 'directed' in the sense that it captures the adaptation for a purpose (i.e., the theory of fit (Otley, 1980)).

I define MAA as the extent to which changes are made to management accounting practices to maintain fit with the organizational environment. For example, organizations might decide to switch to Activity Based Costing or may wish to incorporate some additional key performance indicators in their scorecards/dashboards due to new strategic directions or regulations. Hence, the level of MAA would determine the extent to which such modifications are carried out. This could be considered a capability since companies that can adapt to new situations and conditions are more likely to attain fit.

According to the Resource Based View of the firm, capabilities refer to an organization's ability to assemble, integrate, and deploy valued resources to achieve competitive advantage (Russo & Fouts, 1997). Resources include tangible, personnel-based, and intangible resources (Grant, 1991). Physical

assets, such as plant, equipment, and inventory, are examples of tangible resources. Intangible resources refer to reputation, brand image, customers, and information systems. Personnel-based resources include technical know-how, organizational culture, training, and loyalty.

Information System Flexibility

Flexibility has been recognized as an important element of an organizations' IT infrastructure (Byrd & Turner, 2000). Davenport and Linder (1994) view IT infrastructure flexibility as a core competency and state that IT infrastructure should enable change in order to effectively respond to new market conditions. IT infrastructure as a concept can be divided into two related components: a technical IT infrastructure and a human IT infrastructure (Henderson & Venkatraman, 1992). The technical IT infrastructure entails the integration and interconnectedness of telecommunications, computers, software, and data so that all type of information can be expeditiously and effortlessly routed through the network and processes (J.F. Rockart, Earl, & Ross, 1996). The human IT infrastructure refers to human and organizational skill, expertise, competencies, knowledge, commitments, values, norms, and organizational structures (Broadbent & Weill, 1997; Broadbent, Weill, & Neo, 1999; Henderson & Venkatraman, 1992, 1993). Gebauer and Schober (2006) define information system flexibility in terms of the flexibility-to-use and the flexibility-to-change the system. Flexibility-to-use refers to the range of process requirements met without requiring a major change to the IS. On the other hand, flexibility-to-change is the degree to which a system can be changed in the future by technical staff (Gebauer & Schober, 2006).

Integration is a key feature of modern information systems, such as ERPS. Most likely, the most defining characteristic of integration is the singe database concept. Chapman and Kihn (2009) report that integration in terms of a common data architecture improves performance by enabling repair, internal and global transparency, and flexibility. These four design characteristics are derived from Adler and Borys (1996) and facilitate an *enabling* approach to management control. Repair refers to a situation where the user can address uncertainties to avoid a breakdown in the process. This may be supported by an IIS if the system allows for some user modifications to the reporting or if the users can drill down information (see operationalization in Chapman & Kihn, 2009). This design feature is desirable so that users can better address unforeseen circumstances. This feature is related to flexibility because modifications to the interface or features need to suit the specific work demands of individuals (Adler & Borys, 1996). An IIS can support this feature as it would allow some configuration through constrained user options (Chapman & Kihn, 2009). Flexibility in this context

refers to flexibility-to-use, but not to flexibility-to-change (Gebauer & Schober, 2006). Flexibility-to-change the system is equally important and needs to be considered as not all required changes to management accounting can be made through user changes. Some changes might require intervention from the IT function through, for example, reprogramming. Given the importance of flexibility in facilitating change, I posit the following hypothesis.

H1: Information system flexibility is positively related to management accounting adaptability.

Information System Integration

The second enabling design characteristic *internal transparency* refers to an IIS' ability to provide an "excellent platform for the development of a control system that can inform its users in detail concerning the inner workings it acts upon" (Chapman & Kihn, 2009 p. 155). Thus, information integration makes processes visible (McAdam & Galloway, 2005) and can support cognitive, as well as managerial integration through standardization and refining the balance between internal and global transparency (Beretta, 2002). Furthermore, Scapens and Jazayeri (2003, p. 229) report that "SAP encouraged greater cross-functional co-operation and team working". Because ERPS are cross-functional, forcing the firm out of traditional, functional, and locational silos (O'Leary, 2000), business unit managers and management accountants might be in a better position to identify weaknesses in current reporting practices. This also agrees with Chapman and Kihn (2009) who argue that IIS may support global transparency through its extensive process mapping and standardization efforts, allowing its users to see how local actions impact larger organizational goals and strategies, as well as by allowing interaction between previously distant individuals (Chapman & Kihn, 2009). The last point (i.e., "the interaction between previously distant individuals") is specifically important as the diffusion of knowledge is critical to innovation (T. Burns & Stalker, 1961).

Studies on cross-functional teams report that when employees from different functional areas of the business work together, they have a bigger potential to generate new ideas and solutions (Anderson, Hesford, & Young, 2002; Baines & Langfield-Smith, 2003; Cohen & Bailey, 1997). Hence, this reinforces the argument that management accountants on cross-functional teams with higher levels

of internal and global transparency might be able to better identify weaknesses of current MAS and initiate a review. Similarly, management accountants are more likely to innovate when they have more interaction with the users of management accounting information, allowing them to learn more about the business units, which can then lead to a variety of management accounting innovations (Emsley, 2005). IIS' are in a good position to facilitate and offer such opportunities. Hence, I predict a positive relationship between IIS and MAA as captured in H2.

H2: Information systems integration is positively related to management accounting adaptability.

Shared Knowledge

In terms of adaptability, I argue that the interaction between the IT function and managers is critical because information systems continuously evolve and change their features (Quattrone & Hopper, 2001). Whereas, the IS may allow a certain level of user customization, major changes to the system can only be made through the support of the IT function. Hence, a higher level of interaction can increase the likelihood that goals between management and IT are aligned. It is also known that collaborative relationships between system developers and end users is a critical source of innovation and can enhance and develop new capabilities (Pan, Teoh, & Seow, 2014; Wheeler, 2002). Furthermore, in-depth knowledge of technologies, processes, and people in and across diverse functional areas is recognized as drivers of organizational performance (Badaracco Jr, 1990), which is also true for the IS group's ability to effectively work with diverse functional groups (John F Rockart & Short, 1991). This relationship has possibly intensified in recent years as business processes have become more embedded in technologies, such as ERPS, and workflow management systems. Thus, management and management accountants today are increasingly dependent on the IT group for technical support and for changes required to the existing information systems. This can be accomplished through *shared knowledge*, which is defined as an understanding and appreciation among IS and managers for the technologies and processes that affect their mutual performance (Nelson & Cooprider, 1996). For example Elbashir, Collier, and Sutton (2011) find that shared knowledge between operational managers and IT along with the intensity of effort (absorptive capacity) is related to Business Intelligence tool adoption and assimilation. This leads to the third hypothesis.

H3: Shared knowledge between IT and other management is positively related to management accounting adaptability.

Management Accounting Effectiveness

An adaptable management accounting system can improve the effectiveness of the management accounting function. Adaptability is necessary because the environments in which organizations operate are likely to change. As predicted by contingency theory and previously discussed, changes in technologies, market conditions, organizational style, and strategy require new management accounting practices (Baines & Langfield-Smith, 2003) and MAS are required to adapt to support manager's new information requirements (Chenhall & Langfield-Smith, 1998; Gul, 1991; Perera, Harrison, & Poole, 1997). A lack of adaptability in light of such changes may result in management accounting systems that are no longer relevant or fit. They may therefore lack the capability to provide relevant information for decision making and control. Hence, an adaptable management accounting system is likely to be more effective than a system that is relatively static. This leads to Hypothesis 4 and to the research model in Figure 1.

H4: Management accounting adaptability is positively related to management accounting effectiveness.

Insert Figure 1 here (Figure 1: Research Model)

Research Design

Data and Method

The sample for the survey consisted of Australian and New Zealand companies. I did not limit the sample to any particular industry or sector, although a constraint applied to turnover, which was a minimum of 1 million AUD. The majority of the respondents were high level managers, such as CEOs, CFOs, and other business unit managers, consistent with previous studies that have studied management accounting (Baines & Langfield-Smith, 2003) and its interaction with IT (Chapman & Kihn, 2009). The Orbis Bureau Van Dijk Database was used to collect the names of the individuals in the sample organizations. Personal e-mail addresses of respondents were available for only a small subset of the companies. I, therefore, sent the survey to the generic e-mail addresses (e.g., investor relations) of the companies, assuming that the e-mail would be forwarded to the relevant person.

The survey was e-mailed in June 2013 to companies in Australia and in New Zealand. In total, 93 responses were received. Of those, 7 were eliminated due to missing data, resulting in 86 usable responses. Additionally, a number of e-mails were received indicating that it was against company policy to provide information on internal matters. In the final sample, 63 firms were from Australia and 23 from New Zealand. The sample size was comparable to relevant previous surveys in Australia (Booth, Matolcsy, & Wieder, 2000) (55 firms) and elsewhere, e.g., Finland (Hyvönen, 2003) (86 firms), Greece (Spathis, 2006) (73 firms), and the UK (Sangster, Leech, & Grabski, 2009) (62 firms). There were more than four observations per measured item in the final model, which is adequate according to Andreas I Nicolaou and Masoner (2013). I also tested for response bias, but no significant differences were found between early and late respondents.

Explorative factor analysis was used to test the internal consistency of the constructs and correlation analysis and Partial Least Squares (PLS) Modeling to test the hypothesized relationships between the constructs in the model.

Measures

All measures had a minimum of three indicators. The ISI measure was based on Chapman and Kihn (2009) and focused on the common database concept, the most prominent feature of the IIS. The measure contained three questions using a seven-point Likert-type scale ranging from (1) disagree completely to (7) agree completely. Cronbach's alpha, a measure of construct reliability equaled 0.83, which was above the recommended 0.7 value (Fornell & Larcker, 1981). Average variance extracted (AVE) for this measure was 0.73, significantly higher than the 0.5 benchmark. One loading was below 0.7 but higher than 0.5. This was not a concern as values that are higher than 0.5 are considered acceptable in explorative studies (Hulland, 1999). IS flexibility-to-use (ISFTU) and flexibility-to-change (ISFTC) were derived from Gebauer and Schober (2006). ISFTU and ISFTC were measured through four and three questions, respectively, using the same seven-point Likert-type scale as IS integration. The ISFTC and ISFTU measures were modeled as second order formative constructs as correlations between the indicators were not expected to be high. For example, 'IT personnel have the skills and appropriate attitude to make changes to the system' does not necessarily mean that the 'systems are designed in a modular way'.

Shared knowledge between the IT function and management was based on Elbashir et al. (2011). The measure contained 4 questions using a seven-point Likert-type scale ranging from (1) disagree completely to (7) agree completely. I modeled this construct as formative as 'understanding the

work environment' and 'appreciation of accomplishments' were viewed as forming, rather than reflecting the construct and also because it involved two different parties. MAA and MAE contained four questions each. One item in each construct was reverse coded. The loadings, Cronbach's alpha, and AVE values were satisfactory as per Table 1, although one indicator was dropped from the MAA measure due to a low loading.

Insert Table 1 here (Table 1: Operationalization of Constructs and Loadings of Reflective Items in PLS)

Results

The average age of the respondents was approximately 50, with more than 8 years of experience in their current position. Only a small proportion of the respondents had non-managerial positions (e.g., controller or accountant), whereas the remaining respondents consisted of CEOs (10), CFOs (39), Finance Managers (11) and other business unit managers. More than half of the respondents had a turnover of at least 100 million AUD (AUD is at about parity with the US dollar). In terms of employees, approximately 33% indicated that they had 101-500 employees, 30% had less than 100 employees, 19% of the firms had more than 1,000 employees, and 18% of the firms employed 501-1,000 persons. The manufacturing and service industries were represented in similar proportions. The most widely represented industries in the respondent group were manufacturing, other services, construction, finance, wholesale, and materials.

Inter-construct correlations, obtained from the SmartPLS software (Ringle, Wende, & Will, 2005), are shown in Table 2. Although not very high, except for the correlation between MAA and MAE, the values were positive and gave an indication that the proposed relations were likely to hold. The square roots of AVE are also presented in Table 2 along with the correlations. These values were larger than the correlations with other values below, indicating that the condition for discriminate validity was met.

Insert Table 2 here (Table 2: Inter-Construct Correlations and Square Root of AVE)

I used the Partial Least Squares Modeling Technique with the SmartPLS software to test the hypotheses (Ringle et al., 2005). PLS analysis confirmed H1 as the path between IS flexibility and

MAA was positive and significant at the 0.05 level (see Table 3). As for H2, although the association was positive as predicted, the hypothesis was not confirmed because the t-value was 0.93, which was below the required threshold value of 1.64. I also tested for a direct relation between ISI and MAE, but this path was also insignificant. Another test was performed to see whether IS flexibility moderated the relation between ISI and MAA. There was evidence of a moderation effect as both the moderating path and the path between ISI and MAA were significant. This is further discussed in the next section. H3 and H4 were both confirmed as the relations were positive and highly significant. R-squared for MAA and for MAE were 0.132 and 0.390, respectively.

Further analyses were also performed to test for non-linearity in the relationships using the WarpPLS software. As previously demonstrated, H2 (without the moderator variable) was not supported. However, the path between IS flexibility and MAA strengthened (0.42) and was highly significant. Furthermore, R-squared for MAD was higher than before (0.28) but lower for MAE (0.31). Overall, these additional tests confirmed the results from SmartPLS. I controlled for size in terms of turnover and employees as large companies may have more resources to adapt their management accounting practices to current needs compared to smaller firms (Hoque & James, 2000; Innes & Mitchell, 1990). No significant path was found with respect to size and MAA.

Insert Table 3 here (Table 3: Path Coefficients and Control Variables)

Discussion and Conclusions

MAA is an important characteristic and capability for the management accounting function as it helps to maintain the fitness of the system and largely determines MAE. I have focused on particular aspects of technical and human IT infrastructures to see whether data integration, IS flexibility, and shared knowledge can explain the extent to which management accounting is capable to adapt to new contingencies. This is important from a contingency theory point of view and the theory of fit as a misfit may affect performance adversely (Melnyk et al., 2013), lead to management accounting stagnation and loss of relevance as witnessed some decades ago. The model has some explanatory power, which contributes to both theory and practice.

As predicted, the results suggest that information system flexibility is a driver of MAA. This is in line with Davenport (1998) and Dechow and Mouritsen (2005) who argue that often organizations do not

change their information system because of difficulties with ERPS. On the other hand, no significant direct relation was found between ISS and MAA. Further analysis revealed that there was a moderation effect of IS flexibility on the relation between ISI and MAA. This might suggest that the way the system is implemented (i.e., in a modular and flexible way or not) may be the culprit rather than integration (or an ERPS) itself. The results also highlight the importance of shared knowledge, values, and communication between the stakeholders of the IS (Rettig, 2007). Finally, I found evidence that MAA leads to MAE due to the systems' ability to provide decision relevant information on an ongoing basis, which is consistent with management accounting theory.

The study contributes to the management accounting and accounting information system (AIS) literature by elaborating on studies that focus on IS and management accounting change and innovation (e.g. Cavalluzzo & Ittner, 2004; Granlund & Malmi, 2002; Ittner & Larcker, 1998; Quattrone & Hopper, 2001, 2006; Rom & Rohde, 2007; Scapens & Jazayeri, 2003; Shields, 1995). Unlike previous research, I do not argue whether IIS, such as ERPS, have an (immediate) impact on management accounting, but instead have sought to explore whether the IS facilitates or hinders management accounting practices from evolving and adapting over time. I introduce the concept of adaptability that encapsulates both, the idea of adaptation for fitness from an evolutionary economics point of view (Dew, Sarasvathy, & Venkataraman, 2004) and continuity. The results indicate that the 'right' IS can act as a facilitator for the development and adaptation of management accounting practices as initially put forward by Innes and Mitchell (1990). However, the results also suggest that a constrained IS may to some extent inhibit management accounting practices from evolving. This is also in agreement with findings from previous research on IIS (Dechow & Mouritsen, 2005; Granlund & Malmi, 2002; Rom & Rohde, 2007).

The results of this study might be of interest to AIS and management accounting researchers in terms of assessing the implications of (maturing) IS on management accounting practices in a broader timeframe. This study is also significant with respect to the recent discourse on the convergence of management and financial accounting (Hemmer & Labro, 2008) and the role of IT within as a facilitator (Taipaleenmaki & Ikaheimo, 2011). However, it is worth noting that IS/IT by itself is often not the motivator or a catalyst for change but, once again, merely a 'facilitator' (Innes & Mitchell, 1990).

The results have some implications for practice. First, although information systems may impact management accounting practices, the reverse may also be true as suggested by Rom and Rohde (2007). However, for this to happen (i.e., to prevent management accounting from stagnation),

organizations need to improve their technical and human IT infrastructure capabilities (Henderson & Venkatraman, 1992). This is especially relevant for companies that still rely on outdated legacy systems. The move towards cloud computing may come as a relief because the cost of switching to better solutions is becoming lower in the light of higher competition in the cloud computing industry and the work being carried out towards data standardization. Despite its risks (Benlian & Hess, 2011; Yigitbasioglu, 2014), cloud computing offers many benefits and allows easy access to advanced software that is specifically relevant for SMEs that lack the resources to invest in cutting edge technology (Marston, Li, Bandyopadhyay, Zhang, & Ghalsasi, 2011).

Furthermore, because IIS, such as ERPS, are inherently complex, two 'issues' are likely to remain important in the future. First, I recommend that organizations periodically provide IT training to their employees, which would highlight capabilities as well as limitations of the current system (Bingi, Sharma, & Godla, 1999). Additionally, IS usability will continue to play an increasingly important role in the light of the ever advancing computing capabilities as it is associated with IS perceived usefulness (Calisir & Calisir, 2004) and IS user satisfaction (Venkatesh & Davis, 1996). Better usability will also improve productivity and require less user training, saving time and costs for organizations (Topi, Lucas, & Babaian, 2005). IS usability is also a potential area for research in the future as Granlund and Malmi (2002) suggest.

A limitation of this study relates to the sample size. The model would benefit from additional testing and confirmation with data from other geographical regions, such as the US or Europe. Additionally, the model could be refined further by using more comprehensive measures for IS flexibility-to-use and IS flexibility-to-change. However, this might require that the survey to be completed by both, business unit managers and IT, which might pose an additional challenge. Further testing is also needed to confirm the moderating effect of flexibility on the relation between IS integration and MAA.

The model explained approximately 13% of MAA. This may be considered a limitation or weakness. However, I did not expect a high R-squared because I chose to focus only on certain (relatively unexplored) aspects within the IS and it is known that a host of other IT and non-IT related factors impact management accounting change and innovation and potentially adaptability. These are data quality and availability issues (Cavalluzzo & Ittner, 2004; Shields, 1995), management accountants' or managers' characteristics, such as education and qualifications (Emsley, Nevicky, & Harrison, 2006; Naranjo-Gil & Hartmann, 2007; Naranjo-Gil, Maas, & Hartmann, 2009), as well as role

involvement (Emsley, 2005) and organizational design (Abernethy & Bouwens, 2005; Baines & Langfield-Smith, 2003).

In this study, I looked at management accounting practices in general and did not focus on a particular area, such as performance management or management control. Future research could therefore investigate the impact of the IS on more specific areas of management accounting and control. Finally, future research could adopt qualitative methods to study the relation between the IS and MAA. For example, a multiple case study would provide some in-depth information about management accounting choices in the light of IS considerations, such as limitations or capabilities.

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Table 1: Operationalization of Constructs and Loadings of Reflective Items in PLS

Constructs and Indicators	Loadings	Cronbach's Alpha	AVE
Reflective Constructs			
Information System Integration			
1. Information in reports produced by our information systems is entirely based on common sources of data (e.g. a common database).	0.97	0.83	0.73
2. We have fully-integrated information systems that contain both financial and non-financial information.	0.98		
3. Information systems used in our organization have access to the same data source.	0.54		
Management Accounting Adaptability			
1. Changes to management accounting techniques and tools are made when necessary.	0.86	0.84	0.76
2. Management accounting reports evolve with changing needs.	0.90		
3. We have the flexibility to change our internal reporting practices if required.	0.86		
Management Accounting Effectiveness			
1. Management accounting in our organization is considered effective.	0.83	0.77	0.59
2. Internal reporting does not meet the requirements of the management.	0.76		
3. Management accounting is capable of providing all the information required.	0.69		
4. Management accounting reports are useful and relevant for decision making.	0.77		
Formative Constructs			
Information System Flexibility to Use			
1. Information systems are flexible in terms of functionality			
2. Information systems are flexible in terms of database scope			
3. Information systems are flexible in terms of user interface			
4. Information systems are flexible in terms of processing capacity			
Information System Flexibility to Change			
1. IT personnel have the skills and the appropriate attitudes to make changes to the information systems.			
2. Applications are compatible and allow access to each other.			
3. Our systems are designed in a modular way and require relatively little effort and vendor intervention to make changes to the system.			
Shared Knowledge			
1. Managers understand the work environment (problems, tasks, roles, etc.) of the information systems managers.			
2. Information systems managers understand the work environment (problems, tasks, roles, etc.) of other managers.			
3. Managers appreciate the accomplishments of the information systems managers.			
4. Information system managers appreciate the accomplishments of other managers.			

Table 2: Inter-Construct Correlations and Square Root of AVE

	Reflective Constructs			Formative Constructs		
	ISI	MAA	MAE	KS	ISFU	ISFC
ISI	0.885					
MAA	0.129	0.871				
MAE	0.169	0.624	0.768			
KS	0.031	0.316	0.380	NA		
ISFU	0.037	0.147	0.083	0.034	NA	
ISFC	0.068	0.068	0.032	0.034	0.086	NA

Square root of AVE in diagonal for reflective constructs

NA: Not applicable to formative constructs

Table 3: Path Coefficients and Control Variables

	Hypotheses	Coefficient	T-statistic
H1	IS Flexibility -> Management Accounting Adaptability	0.139	2.19*
H2	IS Integration -> Management Accounting Adaptability	0.122	0.93
H3	Shared Knowledge -> Management Accounting Adaptability	0.305	4.42**
H4	Management Accounting Adaptability -> Management Accounting Effectiveness	0.625	11.95**
	Control Variables		
	Turnover	-0.049	0.47
	Employees	0.037	0.36

R squared MA Adaptability: 0.132, MA Effectiveness: 0.390

** Path significant at the 0.01 level.

* Path significant at the 0.05 level.

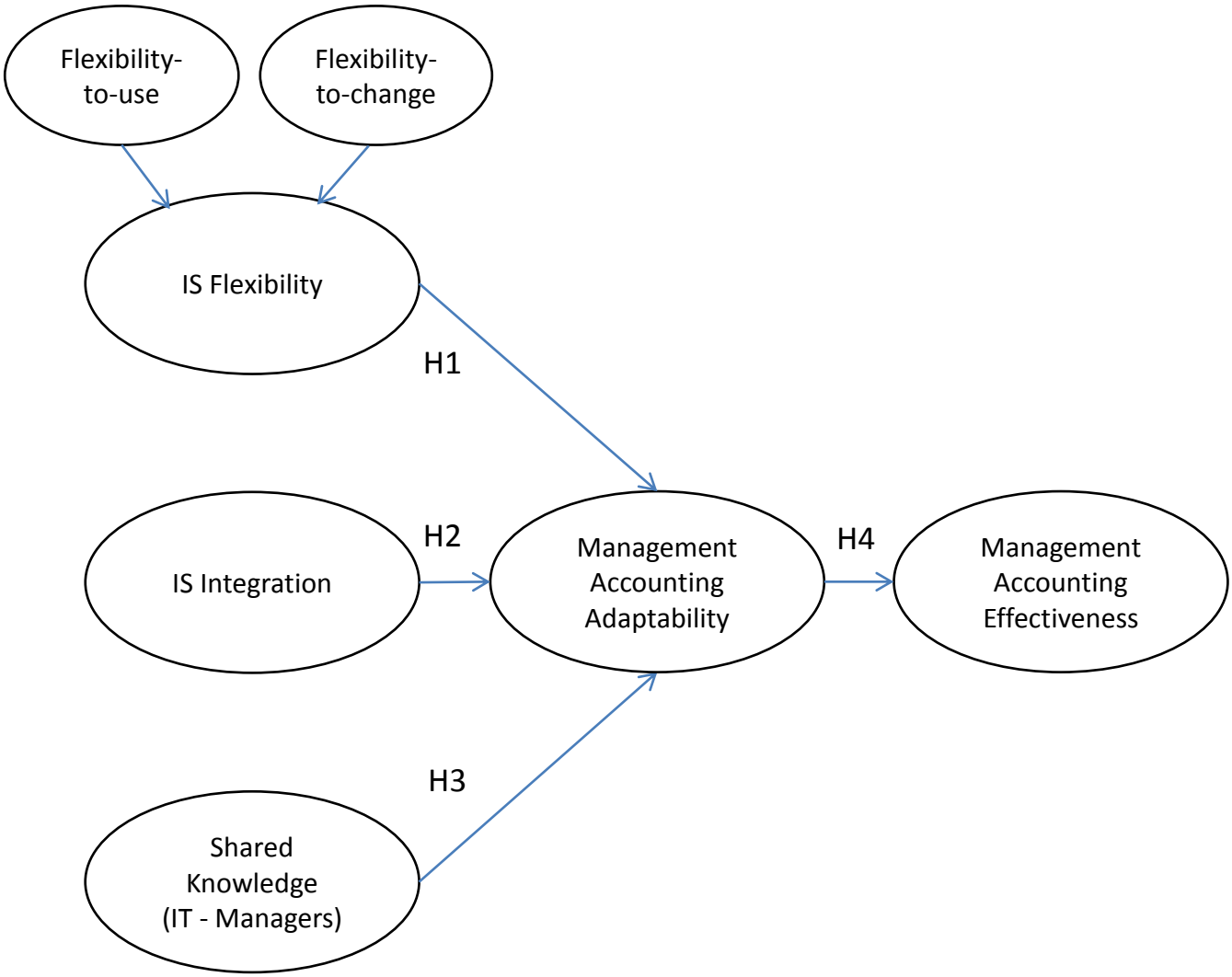

Figure 1: Research Model