Management accounting and integrated information systems: A literature review

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Abstract

In order to further advance research within management accounting and integrated information systems (IIS), an understanding of what research has already been done and what research is needed is of particular importance. The purpose of this paper is to uncover, classify and interpret current research within management accounting and IIS. This is done partly to identify research gaps and propose directions for future research and partly to guide researchers and practitioners investigating and making decisions on how to better synthesise the two areas. Based on the strengths of existing frameworks covering elements of management accounting and IIS a new and more comprehensive theoretical framework is developed. This is used as a basis for classifying and presentation of the reviewed literature in structured form. The outcome of the review is an identification of research gaps and a proposal of research opportunities within different research paradigms and with the use of different methods.

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1. Introduction

That information systems are able to deliver support for management accounting is not a new idea. It is argued, on the other hand, that the first use of information systems was in relation to accounting (Brady et al., 2001, p. 18; Shields, 2001, p. 3). It was the purpose of the first information systems to automate the processes of, for example, posting transactions to journals and sorting the transactions according to the chart of accounts of the general ledger. Regardless of this, however,
Research within management accounting and information systems is coming alive again with the advent of integrated information systems such as enterprise resource planning (ERP) systems. Previously, each function within an organisation had its own information system that operated separately from the information systems of the other organisational functions (Davenport, 1998). With the introduction and wide-spread adoption of so-called ERP systems in the 1990s, new potential for information systems to support management accounting have emerged.

Research on management accounting and integrated information systems (IIS) has evolved across a number of different research streams. Some research streams put heavier emphasis on the management accounting side, while other research streams put emphasis on the information systems side. Likewise, different research streams approach the topic from different perspectives. In combination this research provides a growing body of knowledge concerning the relationship between management accounting and IIS. In order to further advance research, an understanding of the extant research and opportunities for future research are of particular importance.

The purpose of this paper is to uncover, classify and interpret current research within management accounting and IIS. This is done in part to identify research gaps and propose directions for future research and in part to guide researchers and practitioners investigating and making decisions on how to better synthesise the two areas.

This paper is organised as follows. The method used for the literature review is discussed in Section 2. The theoretical framework for synthesising research within the field of interest is developed in Section 3. The literature review in Section 4 is centred on concepts and their relationships within each relationship i) the theoretical logic is discussed, ii) the research findings are reported and iii) the applied research method and paradigm are identified. Finally, in Section 5 directions for future research are suggested and conclusions are drawn in Section 6.

2. The method of the literature review

In order to identify all relevant literature within the topic of management accounting and integrated information systems the recommendations by Webster and Watson (2002) were followed. The literature search included the following steps:

1. Keyword search using the Business Source Complete database
2. Review of relevant journals (see list in Appendix A)
3. Review of relevant conferences (see list in Appendix B)
4. Review of references of publications identified in step 1, 2 and 3 (going backward)
5. Identification of publications citing the key publications (going forward)

It is the purpose of this literature review to identify theories and concepts within the research field of management accounting and information systems. Thus, saturation of the publication search was researched when new publications did not seem to add new theories or concepts (Webster and Watson, 2002). Thus, not all publications on the topic of management accounting and integrated information systems are included in the literature review.

Several methods for retrieval of relevant literature were used. The purpose of the method triangulation was to ensure that no relevant publication was missed during the literature search. The triangulation of search methods seemed to be fruitful as new publications were found during each step.

The literature review is concept-centric rather than author-centric (Webster and Watson, 2002) or paradigm-centric (Burrell and Morgan, 1979; Hopper and Powell, 1985; Puxty, 1993; Ryan...
et al., 2002). On the basis of concepts identified in the literature, a theoretical framework is developed. The literature is reviewed with reference to the theoretical framework. To the extent that concepts and relationships are empirically investigated, the findings are reported. Suggestions for further research are supplied for concepts and relationships that lack empirical investigation.

3. Development of a theoretical framework

As the purpose of the framework needed in the current situation is to be able to map all existing and future research within IIS and management accounting, the criteria function of the framework is that it encompasses all aspects of IIS and management accounting as identified in the literature reviewed. Furthermore, the variables that in different ways impact the relationship between IIS and management accounting must also be included. Finally, the framework should also be independent of the research paradigm in that research within all paradigms should be includable.

Existing frameworks on management accounting and IIS do not seem to be able to fulfil the primary purpose of a needed framework and still score high on all dimensions of the criteria function. Most management accounting and control frameworks (e.g. those by Flamholtz et al., 1985; Simons, 1995) do not explicitly incorporate IIS. The same is true with regard to frameworks within information systems research (e.g. Dehning and Richardson, 2002; DeLone and McLean, 2003) as they do not explicitly incorporate management accounting.

There are examples of frameworks that deal with a combination of IIS and management accounting. One such framework is that developed by Mauldin and Ruchala, whose framework is task focused: “A primary result of this paper is the proposition that an AIS research model should be reoriented around a task focus” (1999, p. 318). This is in harmony with March and Smith, who write that “technologies are often developed in response to specific task requirements using practical reasoning and experiential knowledge” (1995, p. 252). The framework of Mauldin and Ruchala (1999) centres on four organising principles: i) task focus, ii) design process, iii) contingency factors and iv) task performance. As such tasks could be management accounting tasks as well as tasks in a production department; the focus on management accounting does not seem to be strong enough.

The framework developed by Dehning and Richardson (2002) also has the theme that task characteristics impact task performance (see also Barua et al., 1995; DeLone and McLean, 2003, who develop comparable frameworks). While Dehning and Richardson’s framework, as such, does not include management accounting, it has a clear logic that could be used in some form in the framework that will be developed in this paper.

A third and final framework to be discussed is that of Hartmann and Vaassen (2003). The purpose of their paper is to develop a framework of management control that suits contemporary organisations characterised by mass customisation, ambiguous tasks and flexibility. They propose a framework composed of an information domain, a communication domain and a business domain. Accounting information systems are expected unidirectionally to impact the communication domain (which is composed of management accounting and internal control). The communication domain is then expected to impact the business domain, which in turn impacts organisational performance. As with the previously discussed frameworks, this framework also includes performance. The strength of this framework is that it explicitly incorporates management accounting. The weakness is that all relationships are expected to be unidirectional, which is unlikely to be the case in real life. This unidirectionality excludes much research within the interpretive paradigm.

While these three frameworks each have their strengths and weaknesses, none of them seem to fulfil all the purposes and needs of a needed framework. But each framework has some strengths...
that will form a basis when developing a framework that better illustrates the relationship between management accounting and IIS, including context (mediating and moderating) and outcome variables.

The first two concepts are management accounting and IIS. While existing frameworks recognise to a lesser extent the multiplicity of components of the IIS and the different characteristics of these components, the new framework includes a decomposition of the IIS into components and characteristics. Different components and different characteristics seem to have an explanatory effect in the literature reviewed (e.g. Hyvönen, 2003 on BoB vs. ERP systems and Wieder et al., 2004 on ERP vs. supply chain management (SCM) systems).

An IIS consists of several components. An example of a component of the IIS is the ERP system. ERP systems are not the only systems that have the potential to support management accounting. For instance, the balanced scorecard is implemented with software from, for example, Hyperion and QPR, while budgeting is supported by software such as Cognos (Granlund and Malmi, 2002). Thus, information systems other than ERP systems should be included in the range of information systems that support management accounting. Following this line of argument, Shields (2001, p. 10) introduces the term extended enterprise system (XES), which encompasses, for example, ERP systems, data warehouses as well as executive portals.

IISs could also be described via their characteristics and components. One characteristic is that of integration. Booth et al. (2000, p. 3, elaborating on Bhatt, 1995) identify three dimensions of integration: data integration, hardware/software integration and information integration. Data integration refers to the aforementioned characteristic of IISs that data are stored and maintained in one place only. Hardware/software integration is about network connectivity in that computers can communicate with one another. While data and hardware/software integration refer to the technical aspects of integration, information integration refers to the business aspects. Information integration is about the interchange of information between different departments, i.e. that technical integration is put to use in the business processes. In this paper, the focus is on the relationship between IISs and management accounting. The lens used adopts the assumption that information integration belongs to the management accounting domain. Data integration and hardware/software integration continue to be characteristic of IISs. It can be argued that having one graphical user interface is not an absolute necessity as long as data are integrated. Thus, individual information systems are included within the definition of IIS as long as they are integrated into the remaining IIS at the data level. Another important characteristic is that of transaction-oriented vs. analysis-oriented information systems. ERP systems are examples of transaction-oriented information systems whereas for example BSC software are examples of analysis-oriented information systems. When reviewing the literature, other characteristics were also identified. Primary characteristics of interest are flexibility, scope of the system, functionality, complexity, user-friendliness and level of effort needed to implement the system.

Management accounting is divided into tasks, techniques, organisation and behaviour as well as use and perceptions. The literature investigates the relationship between ERP systems and different aspects of management accounting. To provide some examples, Booth et al. (2000) investigate tasks, Granlund and Malmi (2002) investigate techniques and Quattrone and Hopper (2005) investigate the organisation of management accounting, while Dechow and Mouritsen (2005) investigate the use, perceptions and enactment of ERP systems. From a functionalistic and normative perspective, the focus on tasks adopted from Mauldin and Ruchala (1999) is natural as tasks should define the techniques and the solution of tasks should be organised in some optimal manner, while the use of techniques and information systems should support the solution of tasks.

The relationship between IIS and management accounting is bidirectional. Major parts of the research on the relationship are unidirectional and it is expected that the IIS impacts or enables
management accounting. Granlund and Malmi (2002) argue that the IIS is more likely to impact management accounting as ERP systems are hard to change once they are configured (Davenport, 1998). The impact of management accounting on IIS may have a longer time horizon as changes to the IIS are not easily carried out. Luft and Shields (2003) argue that when deciding the direction of the unidirectional arrow, one should choose the direction that manifests itself first. But this is not an argument for delimiting research to that of unidirectionality.

Several variables mediate or moderate the relationship between IIS and management accounting. Especially literature within the contingency theory offers several variables, including perceived environmental uncertainty (PEU) (Chong and Chong, 1997), strategy (Gerdin and Greve, 2004), bureaucratisation (Gordon and Miller, 1976), task complexity (van der Veeken and Wouters, 2002) and resources such as the skills of employees (Gordon and Miller, 1976). While contingency variables gain considerable attention in the contingency literature, other streams of research consider contingency or context variables. This is, for example, the case of institutional theory, where the impact of external organisations such as consultants is investigated (Ansari and Euske, 1987). The context variables can be many and it is not the purpose of the framework to put forth an exhaustive list of such variables. Context variables are mediating variables when, for example, the IIS causes some change in the strategy. The IIS may enable the company to pursue a strategy of just-in-time (JIT) production. The change in strategy might in turn cause a change in management accounting. This is very likely as the purpose of management accounting is to produce information (e.g. the evaluation of the success of strategies (Horngren et al., 2005, p. 5)).

Context variables can also be moderating variables, which, for example, is the case of tasks that require action-centred skills. In this situation, transaction-oriented components of the IIS are able to support the management accounting carried out by lower-level managers. In the case of tasks that require analytical skills, a business intelligence system might better support higher-level managers (van der Veeken and Wouters, 2002). Context variables can both impact and be impacted by IIS and management accounting. Furthermore, the relationship need not be linear. One research stream is particularly interested in the role of power and politics (e.g. Bariff and Galbraith, 1978; Markus and Pfefller, 1983; Skærbæk, 1998; Abernethy and Vagnoni, 2004). The IIS has the ability to shift power bases. When implementing a performance monitoring system, power might shift to top management. Organisational members might be aware of this and may try to influence the implementation project so that the shifting of power is minimised. Furthermore, the IIS or management accounting can also be used as a means of legitimation (DiMaggio and Powell, 1983; Ansari and Euske, 1987).

Though not directly a part of the relationship between IIS and management accounting, the performance variable is included in all of the frameworks reviewed above. A relatively large stream of research investigates the performance effects of investments in IT, especially in the literature on information systems and accounting information systems (e.g. Dos Santos et al., 1993; Hayes et al., 2001; Poston and Grabski, 2001; Hunton et al., 2003). Studies on the financial effect of IT investments are not considered to be within the framework, although accounting metrics are used for the measurement of performance. Performance is measured by a number of variables. In the early literature, performance was almost only measured by share prices and the financial metrics available from archival databases. Recent research now advocates and applies a more sophisticated approach to performance measurement by including leading and lacking indicators (e.g. DeLone and McLean, 2003) or by measuring performance according to the balanced scorecard (e.g. Kennerley and Neely, 2001; Wieder et al., 2004). The construct of performance can even be extended to such a degree that the management accounting construct is included as a leading indicator. Thus, management accounting can in some studies be considered
as the driver of performance and in other studies as a part of the performance measure as a leading indicator.

Similar to the other variables of the framework, performance is included with a bidirectional relationship. While it seems obvious to consider performance as an outcome variable, it can also be an explanatory variable. One hypothesis could be that higher performing organisations have better opportunities for turning investments in IIS into improvements in management accounting because the contribution of, for example, human resources is necessary for turning an ERP implementation project into a success. In this case, performance would be part of the context variables (Umble et al., 2003).

Finally, the framework is independent of a research paradigm (e.g. Burrell and Morgan, 1979; Hopper and Powell, 1985; Puxty, 1993; Ryan et al., 2002), which means that the constructs and their interrelationships can be researched from a functionalist, interpretive and critical research paradigm. The different paradigms ascribe different characteristics to constructs and relationships. Characteristic of the interpretive paradigm is that the IIS is considered an actor (see e.g. Dechow and Mouritsen, 2005 building on Latour, 1987), in the sense that the ERP system of the organisations studied made some kinds of management accounting feasible, while others were not. Research within the functionalist paradigm treats the constructs as objects that can be influenced by humans. Relationships are discoverable. Within the critical paradigm, the goodness of IIS is questioned (e.g. Dillard and Yuthas, 2002; Dillard et al., 2005). Under this paradigm, the IIS is a tool for capitalism to strengthen control over employees and resources. The power construct is quite often in play when the critical paradigm is applied. The power construct, however, can also be studied from a contingency point of view within the functionalist paradigm.

Fig. 1 presents the theoretical framework that is the result of the analyses of current frameworks, the definitions of IIS and management accounting and an extensive search for researched constructs within IIS and management accounting.

As the primary purpose of the framework is to provide a tool for mapping current research so that research gaps can be identified, it is critical to its success that all research can be mapped into the framework. This test is carried out below, as literature on IIS and management accounting are reviewed with reference to the framework. On the basis of the review, directions for further research are identified.

Fig. 1. A theoretical framework for research on management accounting and IIS.
4. Literature review: The findings

4.1. The relationship between management accounting tasks and the IIS

4.1.1. The logic of the relationship

Traditionally, relationships are explored in which the IIS is the independent variable and management accounting tasks the dependent variable. Nonetheless, the reverse relationship where IIS is the dependent variable would also be relevant to investigate. For instance, one could expect that as the design of management accounting reports changes (e.g. change of dimensions), then so must the IIS change. The reverse tension is created by the difficulty in changing ERP systems (Davenport, 1998).

4.1.2. The findings

Booth et al. (2000) decompose management accounting into the tasks of transaction processing, reporting and decision support. Analyzing responses to a survey they find that ERP systems are effective with regard to transaction processing and less effective with regard to reporting and decision support. Similarly, Fahy and Lynch, applying the field study method, find that “...while ERP systems improve the supply of transaction data for strategic management accounting activities, they typically cause significant damage to existing decision support capability of the firm” (1999, p. 1). The argument behind this finding is that companies focus on the transactional part of management accounting tasks, which are the tasks that ERP systems most easily support, taking focus away from strategic decision making. Further, reports are not changed even though one would expect that the quality of reports could be improved with the vast amounts of data and computing power of ERP systems.

Likewise, Dechow and Mouritsen find in one organization studied that the ERP system is good for transaction processing but not for reporting where the case company uses SAS. One informant noted, “…management information has become secondary to operational” (2005, p. 721).

Several authors (e.g. Fahy and Lynch, 1999; Granlund and Malmi, 2002) argue that the missing development of reports can best be explained from an institutionalist point of view (Giddens, 1984). Current reports are an institutionalised part of the organisation. Managers have an established pattern of monitoring through reports and making decisions on the basis of these reports. The old reports seemed perfectly adapted to their needs.

However, not all findings are as negative. Fahy and Lynch (1999) find that implementation of an ERP system leads to better information and more streamlined financial processes. In this vein “ERP-systems are considered to be an important data source for most new accounting practises, but not an incentive for their adoption” (Booth et al., 2002, p. II). Furthermore, Spathis and Ananiadis (2005) find that the flexibility of information provision increases. Interestingly, Malmi (2001) finds that companies adopting the balanced scorecard prefer to collect data manually. Normally, automation is considered to be the best option, but this does not necessarily appear to be the case. The findings provided by Malmi (2001) provide support for the hypothesis put forth by Kaplan (1990) that companies must pass through a phase of disintegration before they move on to integration.

All of these prior findings concern the ERP system. But, as discussed in Section 3 the ERP system is only one among several components of the IIS. A distinction is made between suites and BoB systems. Hyvönen (2003), who investigates the different relationships between ERP vs. BoB systems and management accounting, finds that no difference exists between ERP and BoB systems with regard to the collection of data.
4.1.3. Research method and paradigm

Research on the relationship between IIS and management accounting tasks has primarily applied the survey method. A couple of studies applying field study methods can be added to this. In-depth case studies are absent, however. A characteristic of quantitative studies is that primarily unidirectional relationships are researched. This is also the case in the current literature. All of the survey studies treat management accounting tasks as the dependent variable and the ERP system as the independent variable, which does not necessarily always represent reality. Alternatively, the frequency, dimensions and detail of data collected might change the IIS.

Of further note, the reviewed literature covering this part of the field is primarily conducted from a functionalist viewpoint.

4.2. The relationship between management accounting techniques and IIS

4.2.1. The logic of the relationship

The logic of the relationship between IIS and management accounting techniques seems on first pass to be quite straightforward. Back in 1987, Johnson and Kaplan (1987) called for research that, to a much larger extent, was relevant to the business community. As a response to that, management accounting techniques such as activity-based costing and the balanced scorecard were developed. Despite the availability of innovative management accounting techniques, not all companies seemed to adopt them (see e.g. Chenhall and Langfield-Smith, 1998). Obviously, barriers against adoption seem to exist, with IISs possibly being one of them.

With the advent of more advanced information systems, one would expect that these innovative management accounting techniques could now be implemented. Behind this reasoning lies a unidirectional relationship where the IIS is expected to impact or support change in management accounting techniques. Most publications on the most popular component of the IIS, the ERP system, state that ERP systems are hard to change (e.g. Davenport, 1998). This is true with regard to the implementation phase, where companies are urged to consider the appropriateness of adopting the same business processes as their competitors (Davenport, 1998). This is also true with regard to the post-implementation phase, where the initial configuration cannot be changed, and, as a consequence, companies have to live with their failures (e.g. Dechow and Mouritsen, 2005). That IISs are hard to change is one of the arguments for a unidirectional relationship going from IIS to management accounting (Granlund and Malmi, 2002).

The relationship need not be unidirectional and it would be relevant to explore a bidirectional relationship (Luft and Shields, 2003). In the implementation phase, or even before that, management accounting techniques can change the IIS. The IIS consists of a number of components and the components implemented are likely an outcome of the management accounting techniques for which the organisation needs support. When the implementation phase is over and users are becoming accustomed to the IIS, they try to change the system in small increments, akin to a controlled experiment. Thus, a bidirectional relationship is likely to exist.

4.2.2. The four-stage model of cost systems design

One of the arguments of the ‘relevance lost’ debate is that management accounting is suffering from the precedence of financial accounting (Kaplan, 1988). Since it is mandatory to prepare the financial accounts, these accounts are used by many companies for managerial purposes as well. This brings with it problems for the quality of management accounting since, for example, the allocation of fixed costs to products on the basis of machine hours is not appropriate when performing operational control or product costing. Based on this finding, Kaplan (1988) argues
that one cost system is insufficient. Organisations need a system for each purpose. The same system cannot provide information for financial accounting, operational control and product cost measurement. The characteristics of these management accounting techniques are different in a number of ways (allocations, frequency, precision, scope, etc.).

Kaplan, who experienced that readers of his 1988 article were not fond of the idea of having several different information systems, writes “...executives want any cost system improvements made for managerial purposes to become part of a single official system” (1990, p. 22). Kaplan proposes a four-stage model of cost systems design in which the information system must pass through a phase of disintegration before it finally can be integrated. Kaplan warns organisations against skipping the third phase where each management accounting technique has its own information system. The third phase is where management accountants and IS specialists do the pilot testing. Once through that phase – but not before – it is recommended to integrate the IIS.

Cooper and Kaplan (1998) repeat the message that although integrated cost systems might seem attractive, their potential dangers must be acknowledged.

The question that might be asked is where we are today, 15 years after the launch of the four-stage model. Empirical evidence indicates that organisations are still struggling with disintegrated information systems. Malmi (2001) and Granlund and Malmi (2002) report that balanced scorecards are maintained in separate spreadsheet solutions or specialised software. Quite often, data are entered manually into the systems. Hyvönen (2003) finds that financial departments prefer BoB systems, which is an example of a stage three system. These findings could indicate that companies are still in the third phase. Companies might have tried to skip the third phase. With the first wave of ERP systems, they were said to be able to fulfill the entire need for an enterprise system. As a result, some companies might have tried to integrate everything into the ERP system, thus skipping phase three and going directly to phase four.

Although ‘integration’ is the most widely referred to characteristic of ERP systems, “the level of system integration can be said to be a continuum” (Granlund and Malmi, 2002, p. 304). The most recent implementations of balanced scorecards using specialised software are integrated with regard to data. This is an inherent feature of SAP’s SEM suite (SAP, 2004b) in which data are collected from SAP’s own business information warehouse (SAP, 2004a), which in turn is integrated with the database of the ERP system. Thus, the IIS seems to be moving towards phase four of integrated cost systems. It is, however, another kind of integration, in which the ERP system is not the entire organisation’s system. The four-stage model seems to be able to explain the development of IISs in relation to management accounting techniques. The directionality of the four-stage model seems to be one of the unidirectionality where management accounting techniques are the independent variable. The IIS is expected to develop from one system supporting primarily financial accounting via several disintegrated information systems to an integrated cost system (the IIS). The development of management accounting techniques seems to drive the development of the IIS. The IIS and management accounting techniques are not independent of one another. Thus, the publications of Kaplan (1988, 1990) and Cooper and Kaplan (1998) do not treat the IIS and management accounting techniques as separate systems.

4.2.3. The relationship between ERP systems and management accounting techniques

While the four-stage model has only been subject to theorising, some empirical evidence has been collected on the relationship between ERP systems and management accounting techniques. The majority of research on the relationship between IIS and management accounting has focused on ERP systems.
A case study conducted by Scapens and Jazayeri (2003) indicates that the management accounting techniques used have not changed significantly. One of the reasons for this is given by a plant manager who says that “we wanted what we had before” (Scapens and Jazayeri, 2003, p. 216). This argument for lack of change is also given by Granlund and Malmi (2002), who find that previous principles were simply transferred into the ERP system. Granlund and Malmi (2002) state that ERP systems might have a stabilising effect on management accounting practice, which is an argument from institutional theory (DiMaggio and Powell, 1983).

Management accounting techniques used by organisations prior to the implementation of an ERP system are not changed. In addition, new, more sophisticated management accounting techniques are not adopted using the ERP system (Granlund and Malmi, 2002; Scapens and Jazayeri, 2003). Similarly, Fahy and Lynch (1999) find that no new performance metrics are implemented.

While the above-mentioned authors find no impact of ERP systems on management accounting techniques, Spathis and Constantinides (2004) do. Based on 26 usable survey responses, they indicate that responding companies have increased the use of non-financial performance measures and profitability analyses when the ERP system is implemented. Although the authors state that these are minor changes, they are not necessarily so seen in the context of the rest of the research findings, which indicate that no changes have occurred. But, one must be careful when interpreting the impact of this study since it arguably has major flaws. First, with only 26 responses, the study lacks adequate statistical power for exploring potentially significant relationships, and significance tests are not reported in the article. Thus, the relationships identified may just be due to random variance in the data. Second, the list of modules included in the survey instrument does not appear to be complete, as for example, the often-used module of sales and distribution is not included. Finally, more than half of the respondents work in the information systems department, which seems to be an inappropriate group to survey about the effects of ERP systems on management accounting.

Spathis and Ananiadis (2005) also investigate the Greek setting. They examine 43 survey responses from users of an ERP system within one university. They find that after implementation of the ERP system, financial statements are better and they exploit assets more effectively. The authors write that a large difference exists between the previous and the new system. This factor might be an important explanatory variable for explaining the findings that contradict the findings from other European countries that no major changes in management accounting techniques are found.

What is important to note is that although Granlund and Malmi (2002) and Malmi (2001) report that activity-based costing and balanced scorecard are not implemented using the ERP system; they are not saying that management accounting techniques such as ABC and BSC are not implemented at all. Instead, they are maintained outside the ERP system and operated in separate systems such as spreadsheet systems or specialised software. Specialised software for ABC and BSC are considered more user-friendly and flexible regarding analysis and reporting. Furthermore, Granlund and Malmi (2002) argue that ABC is operated outside the ERP system since the ERP system is too complex. Similarly, Maccarrone (2000) find that reporting tools are outside the ERP system.

Thus, the conclusion that the introduction of ERP systems has not led to changes in management accounting techniques – be they innovative or traditional – seems not to be valid to other components of the IIS. Furthermore, the companies seem purposefully to disregard ERP systems for support of new management accounting techniques. Malmi (2001) finds that companies prefer initiating BSC in a manual mode where they can probe the applicability of the BSC and experiment with it.
Granlund and Malmi (2002) ask whether the missing impact is due to a time lag or whether it is a permanent outcome. The findings of Malmi (2001) could indicate that companies would integrate their BSCs with the ERP system when they are finished probing its applicability and when they are past the phase of pilot testing. This would also be in line with the four-stage model (Kaplan, 1990), where different management accounting techniques are operated in different systems before they are integrated in the fourth phase. On the other hand, it seems more likely to be the case that, for example, BSCs will never be supported by the ERP system, since it is considered to be too complex and specialized software is seen as more user-friendly and flexible. Such an argument questions whether companies will ever move to the fourth phase of the four-stage model (Kaplan, 1990).

The most commonly investigated relationship is a unidirectional one in which the ERP system is the explanatory variable (e.g. Granlund and Malmi, 2002). But Scapens and Jazayeri (2003) question the real impact of the ERP system. They find that the changes taking place were not brought about by the ERP system, since the changes were on their way regardless of the ERP implementation. On the basis thereof, they conclude that ERP systems are not the driver of change. It seems reasonable that it would be overvaluing the impact of ERP systems to state that they alone drive changes in management accounting techniques. On the other hand, it seems likely that ERP systems and other parts of the IIS can facilitate changes in management accounting techniques. Future research should consider this potentially catalytic effect.

4.2.4. The relationship between non-ERP systems and management accounting techniques

Most research within the area of management accounting and integrated information systems has been conducted on ERP systems. But, there is more to IIS than ERP systems, as discussed in Section 3, where the IIS and its components were discussed. This section takes a look at research on the relationship between non-ERP systems and management accounting techniques. Examples of such non-ERP systems are strategic enterprise management (SEM) suites and best-of-breed (BoB) systems. For more technical details on SEM suites and BoB systems, please refer to SAP (2004a,b) and Moriarty (1999) respectively.

The review of the literature on non-ERP systems has as its basis the literature on ERP systems. Granlund and Malmi, who primarily studied the relationship between ERP systems and management accounting techniques and the management accountant’s work, write that “the introduction of so-called SEM modules may provoke companies to adopt methods that they have not used earlier” (2002, p. 315). In addition, they, and also Malmi (2001), write that activity-based costing and the balanced scorecard are examples of systems effectively maintained outside the ERP system in either spreadsheet solutions or in specialised software. The reasons for the widespread use of non-ERP systems are that they are user-friendly and flexible with regard to analysis and reporting. Analysis and reporting belong to the category of management accounting tasks, as discussed in Section 3 above. Thus, that software is good at supporting management accounting tasks seems to have an effect on the relationship between IIS and management accounting techniques.

Expanding on these preliminary findings, Granlund and Malmi ask: “[…] as SEM packages start to be a part of a normal ERP system offering, will this induce companies to change the logic of their accounting and control practices?” (2002, p. 315).

In a vein similar to Granlund and Malmi (2002), Fahy and Millea (2001) find that activity-based costing and shareholder value analysis are not supported by the ERP system. Rather, companies seem to rely on spreadsheets and BoB applications for modelling, as is the case with activity-based costing. Fahy and Millea (2001) seem to define SEM by referring to Granlund and
Malmi (2002). Fahy and Millea write that “SEM is not a technological issue but is instead about integrating best practices in the key strategic management processes of planning, decision making, execution and review to maximise stakeholder returns” (2001, p. 11). This is also the message of Fahy (2000) and Gould (2003). Definitions that mix integrated information systems and management accounting, however, are not useful in this research project, which aims at investigating their interrelationship.

Neither of the above-mentioned studies report impact-full studies on the relationship between SEM suites and management accounting techniques. Rather, the studies appear to simply report hunches and indications.

This does not seem to be the case with Hyvönen (2003), who reports on a study on the use of ERP vs. BoB systems. First of all, Hyvönen makes clear that “companies without an ERP system still integrate their systems using conventional best of breed (BoB) or standalone system components of standard package and/or custom software” (2003, p. 156). This is very well in line with the argument that information systems need not be fully integrated in order to support management accounting techniques. Integration at the data level seems to be enough (Cooper and Kaplan, 1998; Granlund and Malmi, 2002). Thus, the case for BoB systems is made.

Hyvönen (2003) finds that financial departments are implementing BoB systems while other departments (primarily IT departments) are implementing ERP systems. The author also finds that ERP adopters have more problems with budgeting than BoB adopters. This seems to support the findings of Granlund and Malmi (2002) that Hyperion is to a large extent used by organizations for budgeting.

On the other hand, Hyvönen (2003) does not find any significant differences between BoB vs. ERP adopters with regard to the adoption of innovative management accounting techniques. That is, although there seems to be a relationship between BoB applications and budgeting which can be considered a traditional management accounting technique, there does not seem to be a relationship between BoB applications and innovative management accounting techniques. This contradicts the findings reported by Granlund and Malmi (2002) that activity-based costing and balanced scorecard are implemented using specialised software.

To sum up, it is hypothesised that SEM systems and BoB systems might have a relationship to management accounting techniques since these techniques are found to be implemented using non-ERP systems (Fahy and Millea, 2001; Granlund and Malmi, 2002). On the other hand, a non-significant relationship is reported by Hyvönen (2003). Additionally, we must conclude that research within non-ERP systems and management accounting techniques is scarce and that the research that has been conducted has resulted in inconsistent findings.

4.2.5. Design science and REA

A major stream of research within AIS research deals with the modelling of accounting information systems. Several modelling techniques exist within the information systems literature (e.g. entity-relationship diagrams, flowcharts and data flow diagrams). While these modelling techniques can be used when modelling accounting information systems (see e.g. Gelinas et al., 2005), they are not particular to the AIS domain and therefore not part of the literature reviewed here. But, the REA modelling technique is particular to the AIS domain.

The REA model, which maps resources, events and agents, was first described by McCarthy (1979, 1982) and later developed by an exclusive group of researchers (see a review of the REA literature in David et al., 2002). Extensions to resources, events and agents include locations (Denna et al., 1993), tasks (Geerts and McCarthy, 1997) and commitments (Geerts and McCarthy, 2002). In order to test the scope and applicability of the REA model, O’Leary (2004) investigates
the relationship between REA and SAP. He finds that there are substantial similarities, but also some compromises in SAP. He also finds that in many situations the REA model is underspecified. Characteristic of the events supported by the REA model is that they are almost exclusively at the transactional level. The REA literature largely ignores the provision of information for decision making.

As evident in the body of REA research, design science is a normative research stream. Models are built to improve upon practice (David et al., 2002). When models are built, their feasibility is tested by implementing them in practice. Some discussion concerns whether design science should be considered proper research. The line between researching novel extensions to the REA model, verifying it and reproducing it is a very fine one. David et al. identify three characteristics that must be included in design science in order to make it research. These are i) that the research must be truly novel, ii) that the problem addressed is difficult and iii) there is not already a proof of concept or of feasibility (2002, p. 4).

Design science is at the same time a field of research and a research method. Design science as a research method resembles that of the constructive research approach (Kasanen et al., 1993; Labro and Tuomela, 2003; Lukka, 2003). Thus, the research conducted primarily applies an analytic method of building the models. The part of design science that does not deal with the use and perception of the REA modelling technique is within the functionalist paradigm.

### 4.2.6. Research method and paradigm

Research on IIS and management accounting techniques is primarily conducted from a functionalist point of view. Although Granlund and Malmi (2002) apply the institutional theory, they find that primarily economic factors seem to be able to explain the findings. Thus, their arguments end up fitting in neatly with functionalist research.

The research methods applied are diverse. Publications on the four-stage model are theorisations without explicit use of empirics. A variety of research methods are employed in order to investigate the relationship between ERP systems and management accounting. The most often used method is the field study method (Fahy and Lynch, 1999; Maccarrone, 2000; Malmi, 2001; Granlund and Malmi, 2002). Characteristic of these studies is that relatively few interviews are conducted with a large number of companies. In this way, the findings are bound to one specific setting. The depth of field studies is very different from that of longitudinal case studies, as for example, that conducted by Scapens and Jazayeri (2003). Two of the studies (Spathis and Constantinides, 2004; Spathis and Ananiadis, 2005) apply the survey method. The triangulation of research methods adds to the validity of the study, but more in-depth case studies and large-scale surveys would be desirable.

A variety of research methods are also employed in research on SEM systems. On the other hand, most of the research on ERP systems applies survey or field study methods. With regard to research on REA modelling, it is primarily conducted using analytical research methods. But, also interventionist research methods (the design science) are applied when the models are tested.

### 4.3. The relationship between the role of the accountant, the organisation of management accounting and the IIS

Research indicates that management accounting 20 years ago typically was carried out by management accountants. Management accounting was a centralised task and management information was in the custody of the management accountants. Management accountants carried out bean counting tasks far away from the factory floor (Friedman and Lyne, 1997; Burns and...
Baldvinsdottir, 2005). This no longer appears to be the case. Now, management accounting as a set of tasks to be carried out and management accountants are two distinct entities. Management accounting can be carried out by general managers as well as by management accountants and management accountants can carry out management accounting tasks as well as a broader range of tasks such as general management tasks and tasks in relation to maintaining the IIS.

4.3.1. The logic of the relationship

The question is then to what extent the development of the IIS is driving this change or whether the change would have happened without the advent of information systems such as the ERP system. A second question is whether the change in the relationship between management accounting and the management accountant has had an impact on the IIS. The first question deals with whether the IIS is an explanatory variable to the observed change, and the second question deals with whether the impact is reversed where the change in the relationship between management accounting and the management accountant has an impact on the IIS.

A bidirectional relationship would seem plausible. A bidirectional relationship in which the IIS drives the change in the relationship between management accounting and the management accountant should not be unexpected.

4.3.2. Findings: The role of the management accountant

Several authors find that the role of the management accountant has changed. Granlund and Malmi (2002) and Quattrone and Hopper (2001) find that the management accountant is now performing more business-oriented tasks. Lodh and Gaffikin (2003) posit that multidisciplinary knowledge is needed as a management accountant and Scapens and Jazayeri (2003) find that routine jobs are eliminated and that management accountants are playing a broader role. Thus, it seems to be a common finding that management accountants are getting involved in general management by acting as business consultants. But this change does not seem to have happened only recently. Stambaugh and Carpenter write before the massive adoption of ERP systems that “computer systems and advanced modelling techniques are reducing the need for accountants as processors for learning machines” (1992, p. 61). Thus, it is not ERP systems in particular that drive the change. Other parts of the IIS also have an effect.

Management accountants are also gaining a new role in relation to the IIS. Caglio notes that “ERP systems certainly provide accountants with powerful modalities of structuration” (2003, p. 146). Management accountants can choose to take charge of the IIS or they can leave it for someone else. The future role and status of the management accountant is dependent upon this choice. Other professional groups such as IS professionals are also interested in taking charge of the IIS (Sangster, 1996). Being in charge of the systems providing information is a power base (Bariff and Galbraith, 1978; Markus and Pfeffer, 1983).

In summary, it is apparent that the introduction of ERP systems leads to new, hybrid positions (Caglio, 2003). Management accountants now carry out business consulting tasks and IIS maintenance in addition to management accounting tasks. Moreover, it is apparent that the proactivity of management accountants is important if they want to define their future role themselves. However, the management accountant should also be aware that taking charge of the IIS leads to high pressure since many people are dependent upon it working properly (Caglio, 2003).

4.3.3. Findings: The organisation of management accounting

Management accounting at a more transactional level is also carried out by non-accountants. The ERP system has many built in routines that, for example, automatically update the ledgers.
when data are entered in other parts of the system. Today, shop floor workers initiate postings to the stock and payables accounts when they key in a goods returns notice (Quattrone and Hopper, 2001). This is only one of many situations in which management accounting data is automatically captured. Management accounting has become a dispersed activity.

The IIS, which is able to distribute information throughout the organisation, supplies line managers with accounting knowledge so they know their own spending and budgets (Caglio, 2003; Scapens and Jazayeri, 2003). Thus, control is decentralised. Quattrone and Hopper (2001, 2005) even go as far as to argue that everyone can choose to exert control. Supporting this argument, Dechow and Mouritsen, who find that management control is now an activity that is integrated with commercial management, write “Some ERP configurations even may work to separate management accounting practices from financial reporting” (2005, p. 727).

4.3.4. Research method and paradigm

The reviewed publications primarily apply the case study method. While some studies apply field study methods (e.g. Granlund and Malmi, 2002), the literature is devoid of studies using the survey method.


4.4. The relationship between behaviour, use and perceptions and the IIS

4.4.1. The logic of the relationship

Behaviour, use and perceptions are important aspects of management accounting. If implementation and an IIS, or adoption of innovative management accounting techniques, do not lead to a change in behaviour and use, then implementations and adoptions are of no value. As den Hertog and Wielinga state, “The factual use of the system is the basic link between the system’s design and its effectiveness” (1992, p. 126). If tasks, techniques and organisation, to some extent, can be designed and controlled (at least seen from a functionalist perspective), then use can only be designed and controlled to a limited extent. Employees can be trained and given instructions, but their behaviour and what they use is at their discretion. Behaviour, use and perceptions may transform the other parts of management accounting from what was intended to what it becomes. Thus, a bidirectional relationship is expected in that IIS may impact behaviour, use and perceptions, which in turn may also impact the IIS.

Literature on behaviour, use and perception in relation to IIS and management accounting seem advantageously to be split in two parts. The first is the study of behaviour and use from primarily a functionalist perspective. The second part is the study of perceptions from primarily an interpretive perspective. The two parts are reviewed in turn.

4.4.2. Findings: Behaviour and use in relation to management accounting and IIS

The challenge of unlearning common practice was the subject of an early study by Hedberg and Jönsson (1978), who argue that information systems have a stabilising potential, which is also
indicated by Granlund and Malmi (2002). With a stabilising system, double-loop learning is inhibited (Argyris, 1977; Argyris and Schon, 1978). Rather, the IIS should be designed to provide early warning signals. An experiment is set up in which a new IIS with good query and reporting facilities is implemented. Bank professionals, who on a daily basis work with tasks that the new IIS supports, are included, as well as students without any experience with the task. The authors found that students got many new insights, but that after some time, the students also settled with a small number of standard reports; thus confirming the stabilising effect.

The issue raised by Hedberg and Jönsson (1978) is very relevant to ERP systems. Are they able to provide early warning or are they merely stabilisers? Research provides several indications that ERP systems, and probably IISs in general, have a stabilising effect. As noted earlier, an interviewee of the case study conducted by Scapens and Jazayeri noted: “We want exactly the same thing in SAP as we had before” (2003, p. 216). Burchell et al. (1980) identify four roles of accounting (management accounting systems as an answer machine, learning machine, ammunition machine and a rationalisation machine). These four roles are used by Ansari and Euske (1987) to evaluate the use of an IIS. The four roles are coupled with three research perspectives. The authors argue that when accounting is used as an answer or learning machine, then we have a case of rational choice. When accounting plays the role of an ammunition machine, then an IIS is used in a socio-political sense. Finally, when accounting plays the role of a rationalisation machine, then the IIS is used with an institutional purpose. A military organisation in which headquarters induces a reporting system on a subsidiary is studied. The authors find that the information system is not used for making rational choices. Decisions are made on the basis of other systems or non-accounting data. Rather, the information system was used by headquarters to exercise power, and by the subsidiary for legitimacy. Although it is relevant enough to explore the use of an IIS using taxonomy of three theoretical perspectives, it seems a bit rash to conclude that IISs are used for legitimising purposes. If Ansari and Euske (1987) had investigated the use of the system that the subsidiary had themselves chosen for decision-making support, then the authors would probably not have found that the system was not used according to the rational perspective. It would be more reasonable to conclude that IISs are used for different purposes and thereby adopt a view of commensurability rather than one of incommensurability.

Jönsson and Grönlund (1988) investigate the use of accounting information in a manufacturing company. In particular, they investigate how accounting information helps work teams make continuous improvement. The company studied needed to be able to fully exploit technology by adopting new technology in order to offer competitive prices to the one customer for which it was sub-contracting. Thus, the company needed to unlearn the Tayloristic management philosophy in which it had become proficient. Jönsson and Grönlund (1988) discuss the use of behaviour-oriented vs. output-oriented control (Ouchi, 1979). Jönsson and Grönlund argue that “the triggering information will be on output, while search and problem solving will again focus on causal information” (1988, p. 520). The authors set up an experiment where some teams get information systems that they use for improvements in a very interactive way. The supply of non-financial operating data is found to be of great support to the lower-level managers. Finally, the argument that one cost system is insufficient (Kaplan, 1988) is put forward.

Integrated information systems are used differently depending on managerial level. van der Veeken and Wouters (2002) investigate the use of an IIS in a road building company. The use of accounting information is studied at different managerial levels. The authors find that usage varies significantly between the management levels. Site foremen, who have close contact with what occurs on site, hardly use accounting information when it only concerns amounts. Furthermore, they are dissatisfied with accounting information because they believe that it is too late and
unreliable. Due to daily involvement, they already know the financial results; financial reports either confirm their expectations or they are wrong.

It is, a different situation for higher-level managers. Output-oriented information on costs and budgets are accordingly effective at this management level. Accounting information seems able to support the analyses made at higher levels. The authors conclude that output-oriented accounting numbers are usable when analysis-oriented skills are used (as was also found by Jönsson and Grönlund, 1988), while non-financial operating data are needed when action-oriented skills are used. This finding matches the hypothesis put forth by Kaplan (1988) that one cost system is insufficient.

A well-established stream of research exists within the AIS literature that investigates behavioural issues in relation to accounting information systems (Sutton and Arnold, 2002). This stream of research investigates the impact of IT on individuals, organisations and society. It is questioned whether behavioural AIS is AIS research at all, since the accounting content is very limited.

An example of behavioural AIS research is a study carried out by Arnold et al. (2004) on the use and effect of intelligent decision aids. Building on the theory of technology dominance (Arnold and Sutton, 1998), the authors find that smart machines must be operated by smart people. If users are inexperienced, they will be negatively impacted by the system. Furthermore, they will not learn by experience.

4.4.3. Findings: Perceptions and translations in relation to the management accounting and IIS

Functionalist research treats IIS and management accounting as entities that can be designed. This does not harmonise with an interpretive view in which humans are not put above the IIS. Rather, they are treated symmetrically (Lowe, 2001; Dechow and Mouritsen, 2005). An organisation consists of human as well as non-human actors (Lodh and Gaffikin, 2003). Applying actor-network theory, Lodh and Gaffikin (2003) experience that the new SAP system, as well as the existing systems, presented alternatives that battled for influence. Lowe (2001) finds that human actors make relations to non-human actors. This is, for example, the case when the ability to maneuver the IIS constitutes power.

Also characteristic of research on IIS and management accounting that applies the actor-network theory is that ERP systems are not said to automatically integrate, centralise or control (e.g. Dechow and Mouritsen, 2005; Quattrone and Hopper, 2005). Actors can make almost whatever they want of an ERP system. Quattrone and Hopper (2005) describe how one company used the ERP system to collapse the distance between the controller and the controlled. And another organisation used the ERP system to maintain the distance that was of importance to them. Thus, the ability of an ERP system to define integration, control et cetera depends on the situation, i.e. how the ERP system is brought in play. Furthermore, the system itself is also found to be able to point out what management accounting looks like in an organisation (Dechow and Mouritsen, 2005).

Actor-network theory also brings with it an alternative view on change. Quattrone and Hopper (2001) argue that the notion of ‘drift’ should replace that of ‘change’. To judge whether an organisation has changed is not self-evident, but requires choice of criteria.

Research applying the actor-network theory is able to shed light on aspects of the relationship between IIS and management accounting that are not seen through the glasses of functionalist research.

Another perspective on IIS and management accounting is provided by, for example, Dillard et al. (2005). Using a critical framework, they analyse the role of ERP systems in reinforcing
instrumental rationality. According to the authors, instrumental rationality reduces human actions to abstract representations. Dillard et al. write that “ERPs are capable of accentuating and accelerating the conditions that lead to the abdication of moral responsibility” (2005, p. 118).

Dillard et al. (2005) move beyond merely criticising the ideology of ERP systems and suggest that ERP systems should be a facilitator of social change. Although ERP systems are currently a capitalist tool, they can be a tool for an alternative ideology as well.

4.4.4. Research method and paradigm

Two (at least) research streams seem to investigate the relationship between IIS and management accounting behaviour, use and perceptions. The first research stream has a functionalist perspective and primarily applies the case study method. The second research stream has an interpretive and critical perspective and exclusively applies the case study method.

4.5. The effects on and of performance

4.5.1. The logic of the relationship

Whether investments in IIS and management accounting have an effect on performance is certainly of interest. A better IIS combined with improved management accounting is expected to bring with it better firm performance, which in turn should also have an effect on market value. This is the most commonly researched relationship.

Performance might have an effect on the relationship between IIS and management accounting as well. One could expect that high-performing organisations have a better basis for implementing IIS components and making use of them by developing the management accounting. This relationship is looked at in Section 4.7, which discusses context variables in relation to IIS and management accounting. Thus, this section focuses on a unidirectional relationship.

4.5.2. Findings

One distinctive stream of research deals with the question of performance effects of information systems in general and of IIS and management accounting in particular. Back in the early 1990s, researchers could not find a significantly positive relationship between investments in IT and performance measured by either firm performance or market value. This is referred to as the productivity paradox (Brynjolfsson, 1993). One explanation given for the phenomenon that investments in IT have no impact on performance is that expenditures on IT investments offset the gains. As time passed, however, research findings began to indicate that investments in IT, after all, had a positive effect on performance. Dos Santos et al. (1993) find that innovation-based IT investments lead to a positive market response. In 2001, Hayes et al. (2001) find that capital markets place value on ERP implementations, but at the same time Poston and Grabski (2001) find that ERP implementations have no effect on firm performance. A couple of years later, Hunton et al. (2003) found that non-ERP adopters experience decreasing firm performance, while ERP adopters do not. Following these findings the questions turned from one of whether investments in IT have a positive impact on performance to a question of when and why there is a performance effect (Dehning and Richardson, 2002). A literature review on studies using archival data and accounting or market measures of firm performance is provided by Dehning and Richardson (2002).

A lot of variables are left unmeasured in research on the relationship between investments in IT and performance. The hypothesis that investments in IT have a positive effect on performance is a joint hypothesis. A change in business processing is expected to take place in order for
investments in IT to have an effect. Thus, business processes must be included as an intermediate variable. Another way of viewing business processes is to consider them as leading indicators of performance, while measures such as ROE are lagging indicators of performance. The inclusion of leading and lagging indicators or an intermediate variable is done in frameworks developed by, for example, Barua et al. (1995), Dehning and Richardson (2002) and DeLone and McLean (1992, 2003). Management accounting is one example of a business process or a leading indicator.

Kennerley and Neely (2001) investigate the performance effects of an SAP implementation at a manufacturing company in which a case study is conducted. They build a framework with inspiration from DeLone and McLean’s (1992) framework and the balanced scorecard (Kaplan and Norton, 1992). They find that changes have taken place in that, for example, excessive inventory levels are identified. Furthermore, planning is improved, but no identifiable financial impact was observed. It appears that actions have not yet been taken to reduce excessive inventory levels. A time lag seems to exist between implementation of the ERP system, identification of opportunities for improvement, carrying out actions to exploit the opportunities and, finally, identification of improved financial performance. Their study makes a good contribution to research in that it applies the case study method and measures performance along multiple measures.

Another study that measures leading and lagging indicators of performance is the one conducted by Wieder et al. (2004) in which the balanced scorecard is used to identify leading and lagging indicators. On the basis hereof, a number of financial as well as non-financial indicators are found. Whether organisations have adopted ERP or not is found to have no effect on any leading or lagging measure of performance. More detailed ERP variables are needed. In great contrast to what could be expected, findings indicate that ERP system characteristics have an impact on financial indicators but not on non-financial indicators.

Wieder et al. (2004) add an important contribution to the research on performance effects in that they include complementary software as an explanatory variable. Until now, almost all research on the relationship between IIS and management accounting has only considered ERP systems. This seems to be a major limitation. Wieder et al. (2004), who consider the effect of including SCM software in the IIS, find that significantly positive effects of SCM software adoption on supply chain indicators. Wieder et al. “expect that future research on performance impacts of enterprise systems will move from a single-system approach (e.g. ERPS) to a multisystem approach” (2004, p. 40). This is a very important statement in relation to the IIS components variable of the theoretical framework in this paper.

Not much research is conducted where management accounting is included as an intermediate variable between investments in IT and performance. The literature on performance effects of investments in IT primarily uses archival data and does not include information on the management accounting of organisations. When intermediate variables are included, they are included as measures of ancillary by-products such as user satisfaction (e.g. Kennerley and Neely, 2001) and inventory turnover (e.g. Barua et al., 1995). No studies could be identified that examine the relationship between IIS, management accounting and performance.

4.5.3. Research method and paradigm

Most research on the performance effects of investments in IT applies a quantitative method on the basis of either archival or survey data. A few studies apply the case study method. All studies are conducted within the functionalist paradigm. These studies belong to the strong tradition of AIS research.
4.6. Power as a moderating or mediating variable

4.6.1. The logic of the relationship
Several studies indicate that power has a legitimate place in the theoretical framework. den Hertog and Wielinga (1992) argue that the impact of control systems depend upon, among other things, power relations. Power is not considered a primary variable of the research framework, but it deserves a place as a moderating or mediating variable. As a moderating variable, power changes the effect that the independent variable has on the dependent variable. One example of such a relationship is the case where the IIS has a large effect on management accounting since people in charge of the IIS implementation are very powerful. Power can also be considered an intermediate variable when, for example, implementation of a new IIS changes power relations (e.g. more power to employees as opposed to managers), which in turn changes management accounting (management accounting becomes decentralised). Power can both be the independent and the dependent variable.

4.6.2. Findings
Information is a source of power as it is needed for decision-making (Bariff and Galbraith, 1978). Thus, when changes are made to systems that produce information, then power relations may be impacted. But, it is not always the case that IIS implementations will change power relations. This is the case when the new IIS matches the current social structure, culture and values, and thus does not bring with it any alterations.

The IIS also has the potential to change or conflict with the social structure, culture and values, causing some parties to resist implementation, while others will support it (Markus and Pfeffer, 1983). Implementation of an IIS may have several and even opposing effects. Bariff and Galbraith (1978) argue that power shifts downwards as the monopoly of top management, with regard to information, is reduced. On the other hand, the loss by subordinates of the possibility of smoothing data will upwardly shift power. Thus, the effects of and on power relations seem to be highly context dependent.

Abernethy and Vagnoni (2004) conduct an archival study of the relationship between formal and informal power and AIS use. They find that physicians with formal power use AIS to a greater extent. Furthermore, top management uses the newly implemented system for monitoring. Use of AIS is found to have a positive effect on cost consciousness, but the cost consciousness is hampered if people have informal power. In this context, power is an explanatory variable of AIS use. This directionality is in contrast to that studied by Bariff and Galbraith (1978) and Markus and Pfeffer (1983), where the IIS affects power.

From an interpretive perspective, power is also ascribed significance. Skærbæk (1998) proposes a framework for analysing information systems and power and recommends that one must look at i) the content of the IIS (hardware, software, etc.), ii) the social context (social relations, infrastructure and history) and iii) political elements (relations between interests, conflicts and power). Using this framework, he analyses a governmental accounting system. He finds that the accounting directorate, using its power, forces the departments to use a certain system that they find unsatisfactory. The national auditors support the accounting directorate. The departments do not have the power needed to choose another system against the interest of the accounting directorate and the national auditors.

Lowe (2001) states that power is ascribed to accounting technologies. The IIS provides a base for power. Accountants have the opportunity to master the IIS by gaining knowledge about how it works (Caglio, 2003). By doing so, accountants may gain power. But, the implications of an IIS
implementation on power relations cannot be predicted per se. Power relations depend on how the actors make use of the IIS.

4.6.3. Research method and paradigm

Power is primarily studied using the case study method. This is especially the case with the interpretive studies. With regard to the functionalist studies, theoretical reasoning and archival studies are conducted.

4.7. Context variables as moderating or mediating variables

4.7.1. The logic of the relationship

The context variables are not among the primary variables of the framework. The focus is on the IIS and management accounting. Although these two variables are the main variables of the framework, they do not exist in a vacuum. Several context variables bring with them important insights into the relationship between IIS and management accounting.

4.7.2. Context variables used and their impact

Analysis of context variables is not reserved for contingency theory, but contingency theory is particularly interested in context variables, and thus this section builds heavily on contingency studies.

The level of environmental change is a context variable in a study by Hedberg and Jönsson (1978). They argue that it is particularly important to organisations in unstable environments that the information system is able to supply managers with information that hinders stabilisation. This is important since inertia is a threat to the survival of organisations in unstable environments, and information systems tend to be stabilisers.

Jönsson and Grönlund (1988) also investigate the use of information systems in a changing environment. The organisation studied is a subcontracting company faced with a high level of pressure to learn and adopt the newest production technology. Like van der Veeken and Wouters (2002), the authors look into the use of the information system by lower and higher level managers. They argue that the IIS should serve needs of both lower and higher level managers. Lower level managers are found to be able to make most use of non-financial information. Non-financial information supports continuous monitoring of the processes, further investigations of inefficiencies and, furthermore, it supports the process of implementing new production technology.

Bureaucratic vs. organic environments and simple vs. complex tasks are studied by den Hertog and Wielinga (1992). Their study is conducted within a number of engineering workshops within one manufacturing company. The authors find that the information system most well-suited to the workshop with a complex organisation and simple tasks. Furthermore, they find that the implementation of a vertical information system does not fit well with a strategy of autonomy for peripheral units. These two strategies for dealing with increasing complexity and uncertainty do not seem to go well together.

van der Veeken and Wouters (2002) introduce a key concept regarding action-centred vs. analytical skills. Action-centred skills are used by lower level managers such as site foremen. On the other hand, analytical skills are employed by higher level managers when analysing the accounting numbers of several projects. The authors find that financial accounting numbers are not of much use when action-centred skills are employed. Rather, the number of bricks is easier to manage than the cost of bricks used (van der Veeken and Wouters, 2002, p. 364). The opposite
seems to be the case when analytical skills are used. Higher level managers use financial numbers. But still, knowledge about the details of individual projects is needed in order to fully understand the financial numbers.

In a study by Hunton et al. (2003), company size and financial health is included in their quantitative model, where firm performance is dependent upon ERP adoption, company size and financial health. The authors find that for larger firms, financial health negatively affects performance. The relationship is the opposite for smaller firms, where financial health positively affects performance. With these findings, it is argued that firms must be of a certain size in order to be able to handle an ERP implementation project.

The publications reviewed, to a relatively small extent, explicitly study context variables of the relationship between IIS and management accounting. Other studies include context variables as control variables without reporting explicitly on them. Only studies that report on the effects of context variables are analysed here. Much research remains to be conducted on the context variables.

4.7.3. Research method and paradigm

Research that includes context variables and reports on their effect applies quantitative as well as qualitative methods.

5. Directions for future research

In the Previous section research on management accounting and IIS has been reviewed. The review was structured on the basis of the theoretical framework developed in Section 3. On the basis of the theoretical framework literature within seven aspects of the relationship between management accounting and IIS was reviewed. Many suggestions for future research can be identified on the basis of the literature review. Rather than developing a comprehensive list of research opportunities, this section will draw attention to a limited number of research opportunities that seem to be the most promising areas of future research.

5.1. Management accounting techniques and the IIS: Analysis-oriented information systems

Unfortunately, it is characteristic of the current literature that to a large extent it focuses on ERP systems. Limited research has been conducted on other components of the IIS. This seems opaque since research on the relationship between ERP systems and management accounting techniques does not find strong relationships between IIS and management accounting. Several of these studies even argue that analysis-oriented information systems such as SEM systems and specialised software seem be better able to support management accounting (see e.g. Malmi, 2001; Granlund and Malmi, 2002).

Fortunately, some research is beginning to appear that looks at other components of the IIS than ERP systems (e.g. Fahy and Millea, 2001; Hyvönen, 2003). Much more research, however, is needed. An opportunity for future research exists especially within the relationship between specialised software and management accounting techniques. Examples of such software are ABC, BSC or budgeting software. Examples of research questions are: How is the balanced scorecard supported by standard BSC software such as Corporater BSC? What variables can explain the different ways that ERP vs. analysis-oriented information systems support management accounting? How does the use of such systems impact the role and decisions of management accountants and other managers? Research in this area should assist in gaining
important new insights since management accounting is largely supported with such software (e.g. Malmi, 2001).

Survey, case study as well as experimental methods could be applied and each offers different strengths (Birnberg et al., 1990). The choice of research method depends on the research question (Yin, 1994, p. 6). Since several research questions are relevant to ask, several research methods would be applicable. Application of different research methods would strengthen the validity of research (Modell, 2005; Arnold, 2006).

5.2. Management accounting techniques and the IIS: The promise or peril of integration

Integration seems to be the key characteristic of the IIS, apparently the more the better. But, contemporary research indicates that this is not necessarily the case. Case studies such as the ones conducted by Scapens and Jazayeri (2003) and Dechow and Mouritsen (2005) report that ERP systems bring with them such a high degree of integration that it is almost too much. Furthermore, from a functionalist point of view, it is argued that integration must not be strived for at the sacrifice of management accounting (Kaplan, 1990; Cooper and Kaplan, 1998). According to the four-stage model (Kaplan, 1990), information systems that are not fully integrated can actually be better at supporting management accounting in a pilot phase than fully integrated information systems. Finally, research on ERP systems and management accounting techniques find that companies choose lower degrees of integration when they implement, for example, the balanced scorecard using specialised software (Malmi, 2001).

Data integration can also be studied more narrowly. Kaplan (1990) argues that, at present, information produced for financial accounting purposes is used for management accounting purposes as well. Kaplan (1990) would prefer that management accounting was the primary vehicle for cost allocations and that financial accounting then, in turn, used these calculations for inventory valuation, et cetera. In this structure, data for management and financial accounting are integrated.

An information system can be integrated along different dimensions. Booth et al. (2000) identify three dimensions of integration: data integration, hard/software integration and information integration. Furthermore, Granlund and Malmi (2002) note that the level of integration is a continuum. Building on these early studies, that integration is not valuable per se, future research should address the issue of optimal levels for integration. Is integration along all dimensions of integration needed? What is the relationship between integration and different aspects of a management accounting techniques such as activity-based costing and the balanced scorecard?

Again, several research methods could be applied since the body of knowledge is scarce and different kinds of research questions in relation to management accounting techniques and integration can be posed. Depending on the level of abstraction some current research exists (Booth et al., 2000). The survey or experimental methods would be applicable when building on these studies. When aiming for uncovering variables within the relationship between management accounting techniques and integration, the case study method may be more appropriate.

5.3. The role of the accountant, the organisation of management accounting and the IIS: The dispersion of management accounting

Management accounting is currently conducted by a host of different people from business managers to shop floor personnel. That these new groups of people possess insights into the
techniques of management accounting can be questioned, which leads to two opportunities for future research. First, from a functionalist point of view, research is needed on what skills non-management accountants need and what happens to the design and use of management accounting techniques when shop floor personnel posts to the general ledger and business managers are doing budget revisions.

Second, the role of management accounting as a management technology is likely to change. From the perspective of actor-network theory, IIS and management accounting are now taking on new meanings. Management accounting may no longer be the domain of management accountants. How will this impact the way that management accounting is perceived? Will management accounting fuse together with other management domains such as marketing, strategy and organisation? In both cases, case study research seems to be the most appropriate way of uncovering these relationships that seem to be very context dependent and situational.

5.4. Behaviour, use and perceptions and the IIS: Design and use from a functionalist perspective

An in-depth understanding of the relationship between IIS and the design of management accounting techniques and their use is lacking. Studies on the relationship between IIS and management accounting techniques have mostly applied survey or field study methods. Only a few case studies applying a functionalist perspective have been conducted (e.g. Jönsson and Grönlund, 1988; van der Veeken and Wouters, 2002).

More research on specific design considerations is needed. How are the IIS and management accounting techniques designed in practice? What limitations do practitioners experience regarding IIS or management accounting techniques? How do practitioners circumvent these limitations?

Similarly, more research on the use of IIS and management accounting techniques is needed. The insights from Jönsson and Grönlund (1988) and van der Veeken and Wouters (2002) are valuable, but much more research like that is needed.

When studying design and use of the IS in relation to management accounting, the case study method holds potential for helping inform future research. Using this method, the many aspects of design and use reveal themselves. Experimental methods will be more applicable when a limited set of key variables regarding use are of primary interest.

5.5. Management accounting, IIS and performance: Management accounting as an intermediate variable

No piece of research was identified that studied the relationship between IIS, management accounting and firm performance. Several frameworks in which business processes intermediate the relationship between investments in IT and performance have been proposed (e.g. Barua et al., 1995; Dehning and Richardson, 2002). Although not a primary business process, management accounting can be considered one of the business processes. Does better management accounting lead to improvements in firm performance? How does better management accounting impact firm performance and under which circumstances? What kind of fit between management accounting and IIS has the largest impact on performance? Inclusion of management accounting as an intermediate variable would enrich the research stream on performance effects. Furthermore, research on how to evaluate performance effects of IISs supporting management accounting is needed.

Alternative research methods should be better able to uncover the many intermediate variables between investments in IT and firm performance. The joint hypothesis needs to be split in smaller
parts (Dehning and Richardson, 2002). The use of research methods that expand beyond archival data analysis appear critical to expanding our understanding of the dimensions of performance affected and the key sources of likely performance improvements.

6. Conclusion

In this paper, literature on management accounting and IIS was reviewed. The review was organised according to a framework developed with the purpose of providing a comprehensive overview of research on management accounting and IIS. On the basis of this framework and the literature review, selected opportunities for future research were discussed.

Although considerable attention was given to the method and design of the literature review some limitations exist. First, some relevant publications might have been overlooked. Much literature has been scanned by reading the title only. Although the title in most cases describes the content quite well this is not always so. In order to be able to conduct a comprehensive literature review the topical focus was kept relatively narrow on management accounting and IIS alone. This might be regarded a limitation since this literature review will not satisfy the need of readers looking for a review on accounting in general and IIS.

Appendix A. List of journals reviewed


Appendix B. List of conference proceedings reviewed

Annual Congress of European Accounting Association; Annual Meeting of American Accounting Association; European Conference on Accounting Information Systems; New Directions in Management Accounting; Workshop on Performance Measurement and Management Control; Global Management Accounting Research Symposium; Manufacturing Accounting Research Conference; International Research Symposium on Accounting Information Systems;
Asia/Pacific Research, Symposium on Accounting Information Systems; International Conference on Enterprise Systems and Accounting.

References


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