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AN EMPIRICAL INVESTIGATION ON BUSINESS INTELLIGENCE USE IN BUDGETING

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Abstract

This empirical study addresses the research questions of how and why BI is used or not used to support the flexibility and integration needs in budgeting. Budgeting is considered a process with four main activities namely budget construction, budget consolidation, budget monitoring and budget reporting which belong equally to the flexibility and integration domains. Empirical data is obtained from business controllers in seven companies in Thailand which use BI in their budgeting processes. The result from the flexibility domain shows that BI constrains business controllers to achieve the flexibility required to support budget construction and budget reporting. The result from the integration domain shows that an improper enterprise architecture design causes a BI non-use to support budget consolidation and budget monitoring. The analysis concludes that BI non-use occurs from two reasons. First, BI cannot support flexibility in budgeting. Second, BI faces integration limitations due to improper enterprise architecture design. This study contributes to the AIS research in three ways. It contributes to the limited empirical BI research. It urges academia and practitioners to consider BI initiatives in a more critical manner. It observes that BI use for decision-making needs to be complemented with spreadsheets.

Keywords: BI, Budgeting, Management control, Decision-making.

1   Introduction

Information system (IS) technologies have always been a dominant part in a company's accounting process since its inception in the 1970s (Granlund and Mouritsen, 2003). IS technology use in accounting spans over key activities like data collection, data analysis and information presentation (Dechow et al., 2007). Management accounting was one of the first areas that IS technologies were implemented to assist these activities in business organisations. Over the past few years, advances in IS technologies have brought about business intelligence (BI) which is typically marketed as an intelligent IS tool to support management accounting (Adam and Pomerol, 2008). Recent literature reviews (Grabski et al., 2011 ; Vakalfotis et al., 2011) suggest that there is limited understanding as to how BI is actually used to support management accounting. There is limited knowledge about whether business controllers actually employ BI to support management accounting or if they just work around the system. In the case they do use the system, what could have been the impact BI has on the management accounting process in question. A review of BI literature on management accounting reveals that there are a very limited number of research contributions on this particular topic. Rom and Rhode (2006) conduct a comparison between enterprise resource planning (ERP) systems and BI in management accounting works. They conclude that a "better match is seen between [BI][1] and management accounting than between ERP systems and management accounting". Elbashir et al. (2011) examine the influence of management control in relation to knowledge management and resources on BI assimilation in organisations. The study concludes that BI, implemented on integrated and enterprise-wide business databases like the ERP systems, benefits effective management control systems in organisations. It should be noted that there is a consistent indication of the complementary existence between the ERP systems and BI on the enterprise architecture level (Adam and Pomerol, 2008 ; Rom and Rohde, 2006 ; Sanchez-Rodriguez and Spraakman, 2012 ; Vakalfotis et al., 2011) in the sense that the ERP systems provide a database which BI can retrieve data from. Nevertheless, there is no guarantee that BI will be properly employed to support management accounting (Grabski et al., 2011, p.53).

The limited understandings of BI use as well as the inadequacy of empirical BI research in management accounting motivate this paper to focus on BI use in budgeting, which is a classic management accounting practice in modern organisations (Libby and Lindsay, 2010). A new stream of budgeting research building on the levers of controls framework (Simons, 1994) indicates that budgeting can be used interactively and/or diagnostically to assist budgeting (Abernethy and Brownell, 1999 ; Frow et al., 2010). Prior work on IS technologies use in budgeting (Uppatumwichian, 2013a ; Uppatumwichian, 2013b) interpret modern budgeting literature in the light of IS technologies by indicating that budgeting needs *flexibility* and *integration* to support decision-making, seen as the main function in manegement accounting (Anthony, 1965). Flexibility is defined as business controller's discretions over the use of budgeting information to support decision-makings (Ahrens and Chapman, 2004). While integration refers to standardisation of data definitions and structures across data sources (Goodhue et al., 1992).

Budgeting is considered in this paper as a *process* which encompasses four main activities after a modification of Rockness and Shields (1988)'s work. These four activities in budgeting are;

- Budget construction – an activity which local departmental units make forecasts about future business operations.

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[1] The original term used in Rom and Rhode's (2006) paper is strategic enterprise management (SEM) systems. However new academic papers usually refer to the terms SEM and BI interchangeably such as in Elbashir et al. (2011, p.159). SEM and BI are of similar nature due to SAP's decision in 2005 to move SEM from mySAP Financials to SAP BI (Source: http://www.sdn.sap.com/irj/scn/go/portal/prtroot/docs/library/uuid/a24ea690-0201-0010-cfa0-dfccca069c07?overridelayout=true#q-3).

- Budget consolidation – an activity which all departmental budgets are consolidated into an organisational budget according to a generally accepted accounting standard (GAAP).
- Budget monitoring – a continuous monitoring and controlling activity of local department units to ensure that the budget plan is achieved, i.e., in term of expenditure and income.
- Budget reporting – an activity which standard and ad-hoc reports are prepared to detect and/or investigate budget deviations.

BI, in essence, is a decision support system (DSS) which "has been given a new lease of life by the availability of new tools and [IS] technologies" (Adam and Pomerol, 2008). In recent years, BI has been considered to be a leading initiative among global chief information officers (Gartner, 2011) as they tend to believe that BI offers a superior data analysis capability which yields them a competitive edge (Davenport, 2006). Despite the recent BI popularity in business organisations (Gartner, 2011), it is uncertain whether BI will be just another "IS fashion" (Baskerville and Myers, 2009) as there are many criticisms that BI is just a face-lift of DSS (Adam and Pomerol, 2008 ; Watson, 2009). Anyhow, the author is certain that a use of IS technology to support a management accounting function like budgeting will continue to prosper regardless of the IS fashion waves because the idea exists prior to any IS technology invention (Cf: Anthony, 1965).

Having discussed roughly on the flexibility and integration functions in budgeting as well as the BI, section 2 provides more discussions on how the four budgeting activities fit into the flexibility and integration domains alongside a literature review on BI use to support the flexibility and integration domains.

The lack of understanding as to how BI is used to support budgeting motivates this paper to focus on the research questions of *(1) how is BI used or not used to support the flexibility and integration needs in budgeting and (2) why is BI used or not used to support these needs.* This empirical paper aims to describe and explain BI use or non-use pattern in a budgeting context.

This paper is organised as followed. The next section provides a theoretical viewpoint as to how the four budgeting activities fall into the flexibility and integration domains in conjunction with a review of BI literature to support them. Section 3 discusses the research method as well as the companies investigated. Section 4 presents an analysis of BI use in support of the flexibility and integration domains in budgeting. Section 5 ends the paper with research conclusions, suggestions for future research and contributions to academia and practitioners.

2   Budgeting and BI in the flexibility and integration domains

This section first argues how the four budgeting activities posited in the introduction equally belong to the flexibility and integration domains. Later, it shows a literature review as to how BI can be used to support the flexibility and integration domains.

2.1   Dividing budgeting activities into flexibility and integration domains

In connection to the discussion that budgeting, seen as a decision-making process, possesses a dual role of flexibility and integration; it is argued that budget construction and budget reporting fall into the flexibility domain. The participative budgeting technique, commonly adopted in today's budget construction, is a mechanism employed to reduce organisational uncertainties through an assertion of local manager insights and information (Shields and Shields, 1998). The focus on local business requirements is achieved through an ignorance of the enterprise-wide business requirements, i.e., the ERP systems. Therefore the nature of information presented in a budget construction process is flexible in terms of information sources and forms (Uppatumwichian, 2013a). For budget reporting, business controllers need to present and analyse data from multiple dimensions such as sales by customers, regions and products in order to detect budget deviations and decide upon corrective actions. Business controllers have a full discretion over data format and display to support their

decision-makings. The individual reporting requirement is flexible to fit specific, unpredictable and fast-changing circumstances, therefore it does not correspond to static external reporting standards like GAAP which is typically programmed into the ERP systems (Uppatumwichian, 2013a).

On the same token that budgeting becomes flexible, budgeting has also become more integrative (Shields and Shields, 1998). It is argued that budget consolidation and budget monitoring serve the integration domain. Organisations, especially listed companies, are required to be transparent in their budgeting procedures. Thus they are required to make a budget commitment to shareholders in a form of GAAP-complied budget (Uppatumwichian, 2013a). An introduction of advanced IS technologies, like the ERP systems and the BI which enforce a strict data definition throughout organisations from a single database (Kallinikos, 2004), has improved a business controllers' capability to comply with GAAP in the budget consolidation process. The database allows business controllers to collect and integrate consistent budget data from diverse organisation units. In addition, the integrative database quality has also enabled an efficient budget monitoring across organisational units (Uppatumwichian, 2013b). The standardisation of data definitions and structure across business units allow business controllers to effectively monitor and control local unit performance (Chapman and Kihn, 2009).

2.2   BI use to support flexibility and integration

Most available academic publications have emphasised on the BI flexibility to support decision-making (Dechow et al., 2007 ; Melchert et al., 2004 ; Rom and Rohde, 2006 ; Watson, 2009). The fundamental IS technologies behind BI especially the online analytical processing (OLAP), data mining and data warehousing are determined to allow business controllers to make sophisticated multidimensional analysis of financial and nonfinancial information. When business controllers are coupled with the flexibility provided by BI, it is supposed that BI should be able to transform the business controller role from *bean counters* to *business partners* similar to the conclusion made in the ERP system research (Scapens and Jazayeri, 2003).

With regards to the integration domain, most available research is not explicit on how BI could have been applied to assist it. Melchert et al. (2004) and Bringnall and Ballantine (2004) theoretically demonstrate how BI can be used to support the balanced scorecard process. To date, the recent empirical work from Elbashir et al. (2011) is the only publication which demonstrates how the integrative enterprise architecture design between BI and ERP systems can support a management control system in organisations. In general, it is implied that the technological advancements behind BI especially data warehousing can help organisations to integrate and closely monitor business performances (Watson et al., 2004).

3   Research method and company descriptions

This paper is of an empirical nature. The primary research design is a multiple case study which focuses on researching a single phenomenon across organisations without any specific temporal component (Gerring, 2004). This research design is claimed to be superior than a single case study research design (Eisenhardt and Graebner, 2007) because it is based on rich empirical data, therefore it tends to generate better explanations in respond to the initial research aim and questions.

The empirical data used in this study is collected from face-to-face interviews with twelve business controllers in seven leading for-profit companies in Thailand in the autumn of 2011. These seven companies are selected based on the following criteria. First, they use budgeting as their main accounting control. Second, they employ BI for budgeting purposes. Third, they are listed on a stock exchange which is useful with regards to ensuring proper internal control compliance as well as size consistency of the companies. The business controllers are the main focus of this study as it is informed in many academic publications that they have a high influence over strategic and operational practices in organisations (Elbashir et al., 2011). Examples of business controllers interviewed are

chief financial officer (CFO), accounting vice president, business analyst, planning vice president, financial planning manager, vice president of information technology, and customer intelligent manager. Each interview lasts for one hour on average. Every interview is recorded and transcribed. The analysis is conducted using Nvivo 8 qualitative software. The inductive coding technique (Miles and Huberman, 1994, p.61) is adopted to guide the analysis. Coding is performed in two iterative steps. First, a more general *etic* coding is developed to guides researchers to think about categories that the empirical might belong to. Second, a more specific *emic* coding is developed in a close connection to interviewees' categories but nested in the etic codes. In addition to these interviews, direct observation and document examination are conducted to complement the interviews to reduce the risk of accepting manufactured data in interviews (Silverman, 2007).

Company	Main activities	Owner	BI	ERP	Spreadsheets
I	Power plant	Thai	Magnitude	SAP	MS Excel
II	Oil and Petrochemical	Thai	Cognos	SAP	MS Excel
III	Drinks and dairy products	Foreign	Magnitude	SAP	MS Excel
IV	Drinks	Foreign	Own BI	SAP	MS Excel
V	Automobile parts	Thai	Own BI	SAP	MS Excel
VI	Electronic appliances	Foreign	Own BI	JDE	MS Excel
VII	Hotels and apartments	Thai	IDeaS	Oracle	MS Excel

Table 1.   Company descriptions and IS technologies used for budgeting

The companies selected represent many of Thailand's core industries. The first two companies (company I and II) represent the energy industry. Company I is responsible for a quarter of the total electricity production in Thailand. Company II is a Thai-based energy conglomerate which is involved in many energy-related activities pertaining to offshore oil exploration, oil transportation, service stations and petrochemical productions. Company III and IV represent the food industry. Case III is a Thailand branch of a global food company which specialises in dairy products as well as many other drink products. Case IV is a Southeast Asian business unit of an international soft drink company which oversees operations in regions such as Thailand, Malaysia, and the Philippines. Company V and VI are from the automobile industry. Company V is a Thai-based original equipment owner (OEM) which produces made-to-order automobile assembly parts to numerous Japanese car manufacturers. Company VI is a Thai business unit of an internationally-known automobile company which specialises in truck sales and services. The last two companies are from separate industries. Case VI is a Thai business unit of an international electronic company. It focuses on major home appliances such as washers, dryers, fridges and freezers. Case VII is a Thai hospitality conglomerate which manages and owns many five-star serviced apartments and hotels across the Asia Pacific region.

In terms of IS technologies used for budgeting, these companies have access to the ERP systems which provide the information platform to BI. In addition, all companies use spreadsheets to support budgeting. BI, which is the focus of this research, is presented in these companies in many forms. Some companies adopt the off-the-shelf BI solutions available from various vendors such as the IBM Cognos budgeting BI. However some companies (company IV, V and VI) choose to develop their own BI applications in collaboration with IS/IT consultants. These 'own BI' solutions are available in a form of web-based application which is tailored to suit specific companies' budgeting requirements. Table 1 provides a summary of company descriptions as well as the IS technologies involved in the budgeting process in these seven companies.

4   Empirical data and analysis

The analysis presented here is organised according to the concepts of flexibility and integration discussed in the introduction section. It starts off investigating the flexibility domain through budget construction and budget reporting activities. Then it examines the integration domain by means of

budget consolidation and budget monitoring activities. The analysis in this part investigates how BI is used to support the budgeting process. Afterwards the analysis shifts the focus to elaborate why BI is used or not used to support the budgeting process.

4.1 How is BI used to support the flexibility domain

The analysis presented here visits the two budgeting activities, budget construction and budget reporting, which are previously argued they require flexibility.

BI and budget construction - in budget construction, three of the seven companies (company II, IV, V) are using BI for budget construction purposes. Company III, which presently has access to Magnitude BI, is in a pilot process of developing yet another budgeting BI in collaboration with an IT/IS consultant. The newly developed BI is expected to accomplish the task of budget construction. Although it has been claimed that BI can be used for budget construction, inquiries with business controllers in these companies reveal a surprising result that they do not use BI for budget construction. Company II experiences a limited use of Cognos BI. The work function is restricted to revenue budgeting for certain business operations only due to a complication in configuring Cognos BI for diverse business operations that company II has. Besides, assumptions for the revenue budget construction are not properly stored inside BI. The assumptions which are sensitive to fast paced business environments are stored and updated in spreadsheets. Company IV uses the own-developed BI for a limited budget construction purpose. The company as a Southeast Asian regional business unit uses BI to submit a rough regional budget to the global headquarters. With this said, when it comes to a detailed budget construction at the country level, the company encourages regional companies under supervision to use spreadsheets. The Financial Planning Manager in company IV addresses the fact that: "[The BI] is not flexible enough to reflect the differences at the country level. [..] It is not possible to force everyone to comply with the standard [BI]". In company V, the reason behind a development of the BI for budget construction is rooted in various spreadsheet errors which have caused a serious delay in the entire process. BI is perceived as a tool which will improve information disciplines and information accuracies among business units, but not primarily as a tool to improve decision-making. BI is meant to compensate for a lack of experienced business controllers that company V is facing. The idea is to develop a standard form on the BI so that business units can enter the data into the system, then the system will ensure that the calculation process is correct. For the special case (company III) which is piloting the new BI, the Management Accounting Manager reveals a rather negative experience with the new BI. She states that: "Having the new [BI] might make the picture bigger [for the headquarters] but it is not necessary more detailed [for the local units]. It is the requirements from the headquarters which are not working for business operations. If we do not prepare a budget at the stock-keeping unit (SKU) level [on separated spreadsheets], we will not be able to answer any questions if things go wrong". To work around this limited capability of the new BI, she expects that spreadsheets will continue to be *the shadow system* after the new BI installation is completed. The empirical data presented in this section shows that BI use in these companies for budget construction is very limited. In all companies where BI is mentioned in budget construction, it is always operated in conjunction with spreadsheets as business controllers notice that BI does not yet offer a full flexibility for decision-making especially with regards to the level of granularity needed for local business operation.

BI and budget reporting - in budget reporting; only company VII seems to clearly benefit from BI for budget reporting activity. The Customer Intelligent Manager in company VII mentions: "I do not see any drawback with the BI. Before the BI, if I wanted to get any certain performance reports I had to wait for [hotels] to send reports to me in [MS] Excel spreadsheets. There was no way to verify whether those reports are accurate. I would not even know if they lie to me. Now I can retrieve reports from the BI which is linked to the central database. Now I know that this information is accurate". The availability of BI generated reports allows company VII to work closely with hotels in strategic areas. Such transformation is similar to the previous conclusion made in the past ERP research (Scapens and

Jazayeri, 2003) namely that advanced IS technologies can transform the role of business controllers from *bean counters* to *business partners*. Nevertheless this effective BI use is only evident in company VII. It should be noted that BI use for budget reporting is not completed as the interviewee emphasises that she still needs to complement BI with spreadsheets for certain specific reports. The remaining companies (all except company VII) predominantly use BI as a static reporting tool in which they submit routine budgets and actual operating results back to their respective headquarters according to a pre-specified reporting format. Although ERP systems are present in all case companies, it turns out that there is a problem with enterprise architecture design in a way that their ERP systems are not properly integrated nationally or internationally. For example, the CFO in company VI reveals that the current JDE ERP system that the company is using is not compatible with the company's global SAP ERP system. There was a plan to upgrade to SAP but it is on hold for the moment due to the global financial crisis. As a result, financial and management accounting information is submitted to the headquarters via the BI. This practice is true for all Southeast Asia regional companies. BI is seen as a workaround solution to connect isolated accounting data silos. Therefore, these BIs have a limited function for multidimensional data analysis needed in budget reporting. The use practice and benefit of BI found in these companies tends to be that of structured/routine reporting, but not as an IS technology which enables multidimensional budget reporting in support of unstructured/strategic decisions like it should have been.

BI and flexibility conclusion - current BI literature seems to suggest that the recently emerged BI has the flexibility to support decision-making (Rom and Rohde, 2006 ; Watson, 2009). However the empirical data summarised in this session suggests a conflict between BI and flexibility needed for decision-making. BI certainly places limitations on what these business controllers can and cannot do in their budgeting process. In all companies it is evident that the current BI must be supplemented with spreadsheets to accomplish a maximum level of flexibility which business controllers need to support decision-making. The BI role to support decision-making has been reduced from an 'unstructured/strategic decision-making' role to a 'structured/routine decision-making' role. BI use in budgeting is simply yet another representation of headquarters' requirements (in addition to the rigid ERP systems) which restricts what business controllers can or cannot do with the system. Therefore BI does not support the flexibility necessary at local business levels.

4.2   How is BI used to support the integration domain

The analysis presented follows the format applied in the previous section. It visits the two budgeting activities, budget consolidation and budget monitoring, which require integration.

BI and budget consolidation - in budget consolidation, only company II uses the BI for budget consolidation purposes. However, since some affiliated companies have not yet installed and used the BI for budgeting, much of the data required for budget consolidations is from [MS] Excel spreadsheets. The Planning Vice President in company II explains that there are approximately forty affiliated companies which still communicate their budget plans via spreadsheets due to the reason specified in section 4.1 about the BI configuration complication. The budget information contained in spreadsheets is loaded back into BI for budget consolidation purposes. This is because BI provides a more accurate consolidation procedure according to the GAAP. A discussion with the Business Analyst responsible for budget consolidation work in company II reveals that using the Cognos BI might result in a more accurate consolidated budget but not necessarily a faster consolidation time. She states that: "We used to get the budget consolidation done in one day with [MS] Excel spreadsheets. Now it takes a couple days in Cognos [BI]". Budget consolidation in Cognos [BI] is taking longer than spreadsheets because Cognos BI represents a very complex budgeting model, that is, when any assumption in the model has been changed, it will affect other assumptions thus the entire model must be recalculated. In other remaining companies, use of BI for budget consolidation is not evidential. Some companies (e.g. company III and V) are interested in this capability but as of now there is no solid plan to further develop BI functions for this purpose. Despite the availability of BI in

these case companies, spreadsheets are the major IS technology which these companies rely on for budget consolidation processes due to the complication in BI installation company-wide as well as the lack of a proper enterprise architecture design to integrate BI with the ERP system. This point will be exemplified in the next paragraph.

BI and budget monitoring - none of the companies is found to be using the BI for this purpose. Some companies (company I, II and III) are using the ERP systems for this function by keying in final budget numbers from spreadsheets directly into the ERP systems. Thus there is no need for them to rely on the BI as the ERP systems can provide an instant update of actual revenues and expenses in relation to the keyed-in budget numbers. The most important aspect of linking budget data from BI to the ERP systems is that business controllers must be able to properly map data from BI to the data structure on the ERP systems. The Planning Vice President in company II comments: "We have to do a mapping between the Cognos BI and the ERP system. The financial statements from these two systems do not necessarily look the same. In the SAP [ERP] system we have a more detailed chart of account, let's say we have three hundred line items. But in the Cognos [BI] we do not need the same level of details, so we reduce them to one hundred line items for a profit and loss statement. Anyhow we must be able to tell how they are connected. We have to update this mapping structure all the time when we have new line items in either the SAP [ERP] system or the Cognos [BI]". This statement points out to the significance of a proper enterprise architecture design between the ERP system and BI in order to realise a maximum benefit from BI which is the key area that most companies studied are not good at. This is also the reason why budgeting monitoring use in BI is not found in any company. The remaining companies (IV, V, VI, and VII) are using spreadsheets for this function. The normal practice is to download actual financial results from the main ERP systems and compare them with budget numbers in spreadsheets.

BI and integration conclusion - In spite of suggestions in the literature that BI can be applied to support the integration function in management accounting (Bringnall and Ballantine, 2004 ; Melchert et al., 2004 ; Watson et al., 2004), the empirical data has suggested the otherwise. It is believed that the main cause, as suggested in the ERP literature, is that the majority of organisations have still not yet implemented a proper enterprise architecture design between the ERP system and BI (Kallunki et al., 2011). Indeed, this is the major reason why the use of BI for the integration function is still limited. This proposition is supported by the empirical data which shows that spreadsheets are still the major IS technology which most companies rely on for budget consolidation and budget monitoring regardless of the availability of both the ERP system and BI. BI cannot operate in vacuum without additional data support from other IS technologies especially the ERP system (Sanchez-Rodriguez and Spraakman, 2012). When there are potential pitfalls presented in the enterprise architecture design which offers an information link between the ERP system and BI, it affects BI effectiveness. For this reason, it is concluded that BI is not used to support the integration function in budgeting. BI implemented on a poor enterprise architecture design cannot offer any integration capability. Consequently the struggle with BI in budgeting practice leads to spreadsheets domination in the budgeting process.

4.3 Why is (not) BI used to support budgeting

Based on the analysis presented in the earlier sections as to how BI is used or not used to support the flexibility and integration domains in budgeting, this section elaborates on why BI is used or not used to support budgeting.

Budgeting as a popular decision-making tool is deemed in this study to operate in terms of the flexibility and integration domains. BI use to support budgeting activities discussed in the previous two sections is summarised in Table 2. In short, it is concluded that BI use to support budgeting activities is limited with an exception for BI use in reporting. However it is noted that BI is heavily used to support structured/routine reporting but not unstructured/strategic reporting like it should have been.

Company	Flexibility 1.Construction	Integration 2.Consolidation	Integration 3.Monitoring	Flexibility 4.Reporting
I	-	-	-	X
II	X	X	-	X
III	-	-	-	X
IV	X	-	-	X
V	X	-	-	X
VI	-	-	-	X
VII	-	-	-	X

Table 2.   Summary of companies with BI use in budgeting process

The empirical data from the flexibility domain shows that BI constrains business controllers to achieve the maximum level of flexibility required to support budget construction and budget reporting. A BI implementation project is forced with a choice to support certain aspects or functions of business operation alone, for example, the choice to develop BI according to a global requirement which does not reflect local requirements (Company IV). Similarly, the empirical data shows that improperly-integrated BI retrains business controllers to take advantage of the integration function. An improper enterprise architecture design between the ERP system and BI causes a BI non-use to support the integration domain as well as a heavy reliance on spreadsheets. The example in Company II shows that spreadsheets are a significant part of the consolidation process because some of the affiliated companies have not yet installed or used the BI system for budgeting. Following these findings, it is concluded BI is not used to support budgeting process because;

1. Budgeting process demands the level of flexibility beyond what a BI is capable of to offer.

2. Budgeting process demands the level of integration beyond what a BI implemented on a poor enterprise architecture design can offer.

The empirical data indicates that BI is at best used in budgeting process as a solution to *fix* and/or *hasten* certain budgeting activities. However there is lack of strategic thinking as to how BI should be used to support the entire budgeting process in cooperation with the ERP systems.

5   Conclusions and implications

This paper addresses the research questions of how and why BI is used or not used to support flexibility and integration needs in budgeting. The paper is empirically driven but it is grounded in an earlier research that budgeting, considered as a decision-making tool, requires the flexibility and integration domains (Uppatumwichian, 2013a). Empirical data is primarily obtained through interviews with seven companies in Thailand which use BI to support their budgeting process. The interviews are supplemented with observation and document examination.

The analysis reveals that BI impedes the flexibility domain. Business controllers normally rely on spreadsheets to achieve the maximum level of flexibility required for budget construction and budget reporting. Even though it is shown that BI is used in all companies (Cf: Table 2) to support budget reporting, it is highlighted that BI is used merely as an IS technology to support structured/routine decision-making. There is a very little evidence to show BI that is truly used to support a flexible multidimensional budget analysis in support of unstructured/strategic decision-making as the literature suggests (Rom and Rohde, 2006 ; Watson, 2009). Likewise, an analysis on the integration domain shows that BI is not used to support budget consolidation and budget monitoring (Cf: Table 2) like the literature has predicted (Bringnall and Ballantine, 2004 ; Melchert et al., 2004). It is shown that BI is not used to support the integration function because the organisations under study have not yet implemented proper enterprise architecture between the ERP system and BI. In short, it is concluded that budgeting calls for the flexibility and integration functions but BI cannot support them. This is because of (1) the flexibility limitation that the IS technology itself presents, and (2) the integration

limitation that the IS technology faces as it is implemented on an improper enterprise architecture design with other key IS technologies especially the ERP systems.

In comparison to previous empirical research on the BI, this study does not support Rom and Rohde (2006)'s conclusion that BI offers a better match than the ERP systems to support management accounting. This study has shown that BI use to support budgeting is not that different from the ERP system, i.e. BI is not used to support budgeting similar to the conclusion found in the ERP system literature (Granlund and Mouritsen, 2003). However it supports Elbashir et al. (2011)'s conclusion that BI implemented on a properly designed enterprise architecture can enable the management control function in management accounting. It is just the matter that no company under this study manages to achieve this long and windy road yet. Nonetheless one should keep in mind the point made by Grabski et al. (2011, p.53) that a proper enterprise architecture design does not guarantee BI use either. This point clearly deserves more research endeavours.

Having presented this study in the light of previous conclusions, it is clear than more research on BI use in a management accounting context is warranted. This study represents limitations in two main areas that future research endeavours can pursue. First, since this study is geographically limited to only one country, a comparable study can be conducted in another setting to verify whether a similar BI non-use pattern is found. Second, this study does not have a chance to confirm the interesting point made in Grabski et al. (2011) that BI implemented on a properly designed enterprise architecture does not guarantee BI use. It would be very interesting to verify whether this key observation is valid. If it is, how business controllers might work around BI and what could have been explanations for their actions.

This research offers three new insights into the accounting information system (AIS) research. First, it contributes to the limited BI use research in management accounting. It could be said that this study is among the very few publications which offer an empirical insight into this area. Second, it urges academia as well as practitioners to consider any future BI initiatives from a more critical perspective. BI initiatives should be evaluated from the very beginning on the nature of business process in need of support and the intended strategic values that BI could bring about. Later on, an enterprise architecture readiness should be evaluated especially on the connection with the ERP systems which feed information into the BI. Without a careful consideration, BI will not be able to function properly to support the business process. Third it shows that apart from the ERP systems, BI use for decision-making needs to be complemented with spreadsheets. Although BI is believed to deliver the highest level of flexibility to users, business controllers found that the system cannot yet properly support them in the flexibility domain. Therefore they resort to spreadsheets. Practitioner especially those who are BI developers could learn from this and find solutions to offer a seamless integration between BI and spreadsheets.

Acknowledgements

References

Abernethy, M. A. and Brownell, P. (1999). The role of budgets in organizations facing strategic change: an exploratory study, Accounting, Organizations and Society, 24 (3), 189-204.

Adam, F. and Pomerol, J.-C. (2008). Developing practical decision support tools using dashboards of information, In Handbook on Decision Support Systems II(Eds, Burnstein, F. and Holsapple, C. W.) Springer Berlin Heidelberg, p. 151-173.

Ahrens, T. and Chapman, C. S. (2004). Accounting for flexibility and efficiency: A field study of management control systems in a restaurant chain, Contemporary Accounting Research, 21 (2), 271-301.

Anthony, R. (1965). Planning and Control Systems: Framework for Analysis, Graduate School of Business Administration Harvard University, Boston, MA.

Baskerville, R. L. and Myers, M. D. (2009). Fashion waves in information systems reserach and practice, MIS Quarterly, 33 (4), 647-662.

Bringnall, S. and Ballantine, J. (2004). Strategic enterprise management systems: New directions for reserach Management Accounting Research, 15 (1), 225-240.

Chapman, C. S. and Kihn, L.-A. (2009). Information system integration, enabling control and performance, Accounting, Organizations and Society, 34 (2), 151-169.

Davenport, T. H. (2006). Competing on analytics, Harvard Business Review, 84 (1), 98-107.

Dechow, N., Granlund, M. and Mouritsen, J. (2007). Management control of the complex organization: Relationships between management accounting and information technology In Handbook of Management Accounting Research(Eds, Chapman, C., Hopwood, A. and Shields, M.) Elsevier, Oxford, p. 625-640.

Eisenhardt, K. M. and Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges, Academy of Management Journal 50 (1), 25-32.

Elbashir, M. Z., Collier, P. A. and Sutton, S. G. (2011). The role of organisational absorptive capacity in strategic use of business intelligence to support integrated management control systems, The Accounting Review, 86 (1), 155-184.

Frow, N., Marginson, D. and Ogden, S. (2010). Continuous budgeting: Reconciling budget flexibility with budgetary control, Accounting, Organizations and Society, 35 (4), 444-461.

Gartner (2011). Gartner Executive Programs Worldwide Survey of More Than 2,000 CIOs Identifies Cloud Computing as Top Technology Priority for CIOs in 2011. http://www.gartner.com/it/page.jsp?id=1526414. Acessed on: 15-Mar-2012.

Gerring, J. (2004). What is a case study and what is it good for?, American Political Science Review, 98 (2), 341-354.

Goodhue, D., L. , Wybo, M., D. and Kirsch, L., J. (1992). The impact of data integration on the costs and benefits of information systems, MIS Quarterly, 16 (3), 293-311.

Grabski, S. V., Leech, S. A. and Schmidt, P. J. (2011). A review of ERP research: A future agenda for accounting information systems, Journal of Information Systems, 25 (1), 37-78.

Granlund, M. and Mouritsen, J. (2003). Introduction: problematizing the relationship between management control and information technology, European Accounting Review, 12 (1), 77-83.

Kallinikos, J. (2004). Deconstructing information packages: Organizational and behavioural implications of ERP systems, Information Technology and People, 17 (1), 8-30.

Kallunki, J.-P., Laitinen, E. K. and Silvola, H. (2011). Impact of enterprise resource planning systems on management control systems and firm performance, International Journal of Accounting Information Systems, 12 (1), 20-39.

Libby, T. and Lindsay, M. R. (2010). Beyond budgeting or budgeting reconsidered? A survey of North-American budgeting practice, Management Accounting Research, 21 (1), 56-75.

Melchert, F., Winter, R. and Klesse, M. (2004). Alighing process automation and business intelligence to support corporate performance management In The Tenth Americas Conference on Information Systems AIS Electronic Library New York, New York

Miles, M. B. and Huberman, M. A. (1994). Qualitative data analysis: An expanded sourcebook, Sage Thousand Oaks, CA.

Rockness, H. O. and Shields, M. D. (1988). An empirical analysis of the expenditure budget in research and development*, Contemporary Accounting Research, 4 (2), 568-581.

Rom, A. and Rohde, C. (2006). Enterprise resource planning systems, strategic enterprise management systems and management accounting: A Danish study, Journal of Enterprise Information Management, 19 (1), 50-66.

Sanchez-Rodriguez, C. and Spraakman, G. (2012). ERP systems and management accounting: A multiple case study, Qualitative Research in Accounting & Management, 9 (4).

Scapens, R., W. and Jazayeri, M. (2003). ERP systems and management accounting change: opportunities or impacts? A research note, European Accounting Review, 12 (1), 201-233.

Shields, J. F. and Shields, M. D. (1998). Antecedents of participative budgeting, Accounting, Organizations and Society, 23 (1), 49-76.

Silverman, D. (2007). A very short, fairly interesting and reasonably cheap book about qualitative research Sage London.

Simons, R. (1994). How new top managers use control systems as levers of strategic renewal, Strategic Management Journal, 15 (3), 169-189.

Uppatumwichian, W. (2013a). Analysing Flexibility and Integration needs in budgeting IS technologies In Accounting Information Systems for Decision Making(Eds, Mancini, D., Vaassen, E. and Dameri, R. P.) Springer, p. 261-275.

Uppatumwichian, W. (2013b). Understanding the ERP system use in budgeting, In Enterprise Information Systems of the Future(Ed, Poels, G.) Springer, p. 106-121.

Vakalfotis, N., Ballantine, J. and Wall, A. (2011). A literature review on the impact of enterprise systems on management accounting, In Proceedings of the 8th Conference on Enterprise Systems, Accounting and Logistics p.79-105, ICESAL, Thassos Island, Greek.

Watson, H. J. (2009). Tutorial: Business intelligence – Past, present, and future, Communications of the Association for Information Systems, 25 (1).

Watson, H. J., Fuller, C. and Ariyachandra, T. (2004). Data warehouse governance: Best practices at Blue Cross and Blue Shield of North Carolina, Decision Support Systems, 38 (3), 435-450.