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Abstract

This paper explores the use of spreadsheets in budgeting in order to explain how and why spreadsheets are used or not used in budgeting practice. Guided by modern budgeting research, budgeting is considered as a social phenomenon which requires *flexibility* for decision-making and *integration* for management control. Twenty-one interviews with business controllers in eleven leading for-profit organisations in Thailand were conducted for this study. The analysis at the activity level, led by the concept of 'conflict' in structuration theory (ST), reveals that spreadsheets allow a full flexibility over decision-making activities in budgeting. However, spreadsheets are not appropriate for integration in management control as there are many problems and errors associated with the use of spreadsheets. The analysis at the structural level, directed by the concept of 'contradiction' in ST, concludes that the weak characteristics of spreadsheets for integration are contradictory to the budgeting process which fulfils the dual roles of flexibility and integration. This study concludes that use of spreadsheets in budgeting is significant despite the availability of enterprise resource planning (ERP) systems and business intelligence (BI). This study explains that spreadsheets are heavily used because of (1) the lack of integration between financial and management accounting functions and (2) the fit for spreadsheets to support the flexibility in decision-making. This paper offers two contributions. First, it shows an over-reliance on spreadsheets for management accounting practice. Second, it informs academia and practitioners of the need to reduce their reliance on spreadsheets for management control functions because there are many drawbacks associated with it.

Keywords: budgeting, decision-making, management control, spreadsheets.

1. Introduction

Many recent research calls from peer researchers appeal for more contributions to address how information system (IS) technology supports the management control and decision-making functions inherent in management accounting (Berry et al., 2009 ; Granlund, 2011 ; Sutton, 2010). A recent literature review suggests that there is an increasing but still limited number of research contributions (Vakalfotis et al., 2011). Most publications up till now have concentrated on particular technology, such as enterprise resource planning (ERP) systems (Chapman and Kihn, 2009 ; Grabski et al., 2009 ; Granlund and Malmi, 2002 ; Hyvönen, 2003) and business intelligence (BI) (Rom and Rohde, 2006).

Prior research concludes that ERP systems have a limited capability to support decision-making due to the immense complexity of the system architecture (Granlund, 2009 ; Quattrone and Hopper, 2005). However, the systems also have the potential to support management control in organisations (Chapman and Kihn, 2009), but the majority of organisations have still not integrated their financial/management accounting functions on ERP systems to realise this potential (Kallunki et al., 2011). BI, on the contrary, seems to attract a limited research interest according to a recent literature review (Vakalfotis et al., 2011). To date, there is only one study, by Rom and Rhode (2006), which examines the use of BI in decision-making in management accounting. The result attests that the BI system is slightly better than ERP systems to support decision-making; however, there is no indication toward the management control practice. One thing that these researches have in common is that they report that business controllers use spreadsheets to organise and report the information to supplement these advanced IS technologies (Dechow and Mouritsen, 2005 ; Granlund and Malmi, 2002 ; Newman and Westrup, 2005 ; Scapens and Jazayeri, 2003). Fascinatingly enough, none of the aforementioned research has addressed how spreadsheets are used in decision-making and management control in response to the research gap addressed. It is unclear why spreadsheets are taken for granted in accounting information system (AIS) research, despite their widespread adoption for management accounting practices.

This study responds to the aforementioned research gaps by investigating the use of spreadsheets in budgeting in order to explain how and why spreadsheets are used or not used in budgeting practice. Budgeting is selected over other newly invented management accounting tools, such as balanced scorecard or activity-based costing for many reasons. First, budgeting is the heart of organisations (Hansen et al., 2003). It is the only centrally coordinated activity. Second, budgeting is one of the longest standing and the most renowned management accounting practices (Libby and Lindsay, 2010). Third, budgeting can be continuously used to support decision-making and management control (Abernethy and Brownell, 1999) in response to the primary research gap addressed. This study views budgeting as a *process* to achieve a statement for a defined period of time (Covaleski et al., 2006). Therefore it can be said to encompass four main activities: (1) budget construction, (2) budget consolidation, (3) budget monitoring, and (4) budget reporting.

Building from the levers of control framework (Simons, 1994), the new stream of budgeting research considers budgeting to cover the dual roles of management control and decision-making (Abernethy and Brownell, 1999 ; Frow et al., 2010), whereas prior literature often considered budgeting to fulfil the management control role alone (Bruns and Waterhouse, 1975). From these new budgeting researches, it is deemed that the dual roles of budgeting require the process to be *flexible* in response to decision-making and *integrative* to facilitate management control (Frow et al., 2010).

In relation to the research aim to investigate the use of spreadsheets for budgeting activities, *flexibility* is defined as discretion over the use of spreadsheets to support budget-related decision-making activities (Ahrens and Chapman, 2004). In contrast, *integration* is defined as the adoption of standardised data definition and structures across IS technologies (e.g., spreadsheets, the ERP systems and the BI) to support budget-related management control activities (Goodhue et al., 1992).

The dual roles of budgeting between flexibility in decision-making and integration in management control guide this research to concentrate on the opposition discussion in many social science theories, such as institutional theory and organisational learning theory (Robey and Boudreau, 1999). Having reviewed a number of related theories, this research employs the concept of conflict and contradiction in structuration theory (ST). ST is selected over other theories mainly because of its vast potential to uncover human interactions with IS technology, that is, how humans use spreadsheets, the IS technology in focus, in budgeting, which is considered as a social practice (Orlikowski, 1992). More discussion on the concept of conflict and contradiction in ST is provided in Section 2.

This paper proceeds as follows. The next section discusses the concepts of conflict and contradiction in ST. Section 3 moves on to construct two propositions guiding this research. Afterwards, section 4 considers the research method and the case company descriptions. Section 5 presents the data analysis using the conflict and contradiction concepts in ST suggested earlier. The paper ends with the research conclusions and implications in section 6 for both practitioners and academia.

2. Theoretical Background

The basic element of ST is an attempt to move beyond the primacy argument in the social science research between agency and structure (*the dualism of structure*) into *the duality of structure*. To achieve this, Giddens argues that agency and structure represent two sides of the very same coin. He thoroughly maintains that social structures exist as human agency applies them; thus they are the medium and outcome of human interactions. Giddens claims that the *duality* view permits a more satisfactory explanation as to how society proceeds in total in comparison with the old *dualism* view (Giddens, 1979, p.47). Although it is acknowledged that technology is missing from the original theory (Jones and Karsten, 2008), ST is still one of the most common theories in IS research. This is because ST offers a vast potential to uncover the interactions between people and

technology, which is directly the focal point of IS research (Poole and DeSanctis, 2004, p.210).

This paper applies a specific concept of ST according to the earlier classification of ST use in IS research (Jones and Karsten, 2008). It draws on the concepts of conflict and contradiction in ST, which are largely ignored in IS research as well as in other researches (Walsham, 2002). Walsham and Han (1991) suggest how these concepts can be applied to an IS research problem. Referring to Giddens' original writings, he conceptualises *contradiction* as a "disjunction of structural principles of system organisation" (Giddens, 1979, p.131). He explains that contradiction happens because of the clash between systems at the structural level. These systems operate in terms of each other but also at the same time contravene one another. In alignment with the duality of structure, Giddens supplements the contradiction with the concept of *conflict*, which is assumed to take place at the level of social practice or at the real activity level. In his own words, conflict is a "struggle between actors or collectives expressed as definite social practices" (Giddens, 1979, p.131). The relationship between contradiction and conflict is positively correlated. Conditions which fuel conflict are very likely to form contradiction and vice versa (Giddens, 1979, p.145).

Applied in the context of this study on use of spreadsheets in budgeting, *conflict* is deemed to take place between budgeting activities (in relation to the flexibility and integration poles addressed above) and spreadsheets. Likewise, *contradiction* is considered to occur at the structural level between the entire budgeting process and spreadsheets to represent the clash between the social practice and the IS technology. From these conceptualisations, the next section formulates propositions which direct the remaining investigation.

3. Propositions

Building on the interpretation of 'conflict' in ST, as well as the dual roles of budgeting between flexibility and integration, this section reviews prior literature to construct propositions as to how spreadsheets might be used to enable or disable flexibility and integration in budgeting at the activity levels.

Research on management accounting suggests that spreadsheets are commonly used to generate reports and analyse information to support decision-making because of the flexibility that the software offers (Jean-Baptiste, 2009 ; Newman and Westrup, 2005 ; Scapens and Jazayeri, 2003). However, some research has warned that the flexibility in spreadsheets is in fact a double-edged sword. Spreadsheets which allow users to design and put in data and information according to their own requirements contain a high rate of errors (Panko, 2006). This leads to inaccurate information and poor decisions (Redman, 1998 ; Ross, 1996 ; Teo and Tan, 1999). Briefly, it can be said that flexibility in spreadsheets is a conflict in itself. On the positive side, such functionality is ideal to support decision-making. However, when users are not careful with it, the same

functionality thwarts decision-making. These opposing conclusions in the literature give rise to the following propositions.

> Proposition 1A: Spreadsheets *facilitate* flexibility in budgeting

> Proposition 1B: Spreadsheets *impede* flexibility in budgeting

Many writings suggest that spreadsheets are commonly used for budget consolidation purposes as well as for many other management control activities (Croll, 2009 ; Parkinson et al., 2006). A former study has proposed a model on how spreadsheets can be used for budget consolidation (Power et al., 1989). Nonetheless, there is a considerable concern relating to how spreadsheets are used for the purpose of consolidation. Kyd (2007), for example, refers to this practice as the 'spreadsheets hell'. Many accounting affiliations have addressed a similar concern to the profession (CIMA, 2008 ; PricewaterhouseCoopers, 2011 ; Whittaker, 1999) especially in connection with the rise of the Sarbanes-Oxley Act and Basel III (Grabski et al., 2011 ; Panko, 2006), which specifically address a financial information control weakness from spreadsheet integration. The concerns about the integration of spreadsheets are numerous. Examples include fraud, human errors, qualitative and quantitative errors, planning and execution errors (Panko and Aurigemma, 2010). All of these frauds and errors can occur during any step of spreadsheet designs and use. In addition, it is noted that users never set out to audit their own spreadsheets. Organisations have hardly any proper policies to control use of spreadsheets. In short, business practices often use spreadsheets for budget integration purposes but the academic research and many authorities are seriously concerned about the validity and accuracy of the information produced from spreadsheets integration. The opposing conclusions in the literature give rise to the following propositions.

> Proposition 2A: Spreadsheets *facilitate* integration in budgeting

> Proposition 2B: Spreadsheets *impede* integration in budgeting

These propositions will be used to guide the analysis at the activity levels. The next section discusses a research method and gives background information on the companies involved in this study.

4. Research Method and Case Descriptions

This research is based a critical research (Walsham, 2005). The primary research strategy is a case study because it focuses on a single phenomenon (Gerring, 2004), that is the use of spreadsheets for budgeting. The design follows a multiple case study research design without any explicit temporal component, which is addressed in Eisenhardt and Graebner (2007). This design is claimed to be superior to a single case study design because it is embedded in rich empirical data, which tends to generate better explanations of the phenomenon under study.

The empirical data in this paper was collected through face-to-face interviews with twenty-one business controllers from eleven for-profit organisations in Thailand during autumn 2011. These eleven for-profit organisations were selected because they comply with the following criteria: First, they have used spreadsheets and ERP systems for the main accounting/finance functions for at least two years. Second, they use budgeting as the main accounting control in their organisations. Third, they are listed on a stock exchange to ensure size consistency and proper internal controls.

Middle managers (or business controllers) are of particular interest in this study because it is clearly indicated that they have a strong influence over strategic as well as operational practices in organisations (Westley, 1990). Therefore, the interview participants were primarily the middle managers (business controllers) who were directly responsible for budgeting and IS technologies in their own organisations. Examples of interview participants are the CFO, accounting vice president, business analyst, planning vice president and vice president for information technology, etc. Interviews were conducted face-to-face at the participants' locations. In addition to the interviews, the author also had an opportunity to observe how interview participants actually work on their budgeting procedures. During the interview, budgeting-related documents and IS technologies used for budgeting were shown to accompany the interviews. On average, each interview lasted for one hour. Every interview was recorded, transcribed and analysed using Nivo8 qualitative analysis software. The inductive coding technique (Miles and Huberman, 1994, p.58) was adopted for the data analysis in response to the aim of describing and explaining the use of spreadsheets. Coding was performed in two iterative steps; first epic coding followed by emic coding in order to allow a maximum interwoven within the data analysis.

The organisations included in this study represent many of Thailand's core industries. The first group (cases A-C) represents the energy industry. These companies are key participants in the country's energy production chain, which includes activities such as offshore drilling, pipeline transport, refineries, electricity generation, and service stations. It can be said that they supply approximately half of the entire country's energy demands. The second group (cases D-G) denotes the food industry. The foreign-owned cases (cases E and F) are Thai business units of the world's leading food conglomerates. Both own several production facilities in Thailand and distribute final products both domestically and internationally. The remaining cases are leading Thai food companies which produce, distribute and export food products nationally and internationally. The third group (cases H and J) is from the automobile industry. Case H is a Thai business unit of the world's leading automobile brand. It markets, sells and services trucks in Thailand. Case I is an original equipment owner (OEM) which produces made-to-order car parts to numerous Japanese personal car manufacturers. The remaining cases represent diverse industries. Case J is a Thai business unit of an international household electronic appliance company. It specialises in fabric care electronic appliances. Case K is a division of a Thailand-based hospitality conglomerate which operates and owns many five-star hotels and top-class service apartments throughout the Asia Pacific region. In terms of IS

technologies, all the organisations have access to spreadsheets and ERP systems. However, some organisations also have additional access to BI applications for budgeting. Some organisations employ off-the-shelf BI solutions for budgeting purposes but some have chosen to develop their own BI solutions in cooperation with IS/IT consultants according to their own specific budgeting requirements. Table 1 provides a summary of company descriptions as well as the IS technologies that they use.

Table 1. Case company descriptions and IS technologies

Case	Activities	SSs	ERP	BI
A	Power plant	Yes	SAP	Magnitude
B	Oil and Petrochemical	Yes	SAP	Cognos
C	Oil refinery	Yes	SAP	-
D	Frozen food processor	Yes	SAP	-
E	Drinks and dairy products	Yes	SAP	Magnitude
F	Drinks	Yes	SAP	Own BI
G	Agricultural products	Yes	BPCS	-
H	Truck	Yes	SAP	-
I	Automobile parts	Yes	SAP	Own BI
J	Electronic appliances	Yes	JDE	Own BI
K	Hotels and apartments	Yes	Oracle	IDeaS

5. Analysis

This section provides the analysis based on the theory and the propositions presented earlier. It starts with 'conflict' between (1) the spreadsheets and flexibility and (2) the spreadsheets and integration at the activity levels. It later proceeds to discuss the 'contradiction' between the spreadsheets and budgeting at the structural level.

5.1 Conflict at the activity level: spreadsheets and flexibility

Flexibility, defined as discretion over the use of spreadsheets to support budget-related decision-making (Ahrens and Chapman, 2004), is needed in the budgeting process. In relation to the four main budgeting activities discussed in the introduction section, (1) budget construction and (2) budget reporting are the two activities in focus for flexibility. Budget construction is a crucial decision-making process because it entails how

departments will deploy their resources in response to the unique business conditions surrounding them (Frow et al., 2010). Budget reporting is typically conducted during or after the budget period to detect the causes of budget deviation and decide on the necessary actions to prevent future repetition.

In the first activity of budget construction, spreadsheets are the main IS technology that all the case companies rely on. Only one (Case B) out of the eleven case companies mentioned that it employed a BI system for this activity. However, such use is still strictly limited to the revenue budget construction in certain business operations only. This is because the BI configuration for budgeting is extremely complicated and time-consuming. Therefore BI adoption and its use for budget construction are still very limited. The Planning Vice President in Case B mentions the dominant role of spreadsheets for budget construction: "We are considering how we are going to approach budget construction. We think it might be some kind of external system, but for now there is no explicit system to support this process. *Everyone* still has his own Excel [spreadsheets]". A similar practice is also evident in every remaining case, as well as the fact that there is no indication toward use of the ERP system for budget construction, despite the system's availability in all the case companies. The Management Accounting Manager in Case E gives an overview of how budgets are constructed in spreadsheets: "The Excel [spreadsheets] for the coffee portfolio budget, which is the biggest portfolio of our company, is about ten megabytes. They tend to link everything in the same Excel file. They put in various assumptions [for budget construction] such as volume growth and sales growth, etc. I think there must be at least fifty-five different assumptions, because they follow the format of the profit and loss statement that we have to submit to our headquarters. Each line item has its own assumptions; every line is reflected in the coffee portfolio budget. But overall, this thing varies from person to person". The quotation makes it clear that budget construction is a complicated decision-making process since it involves large numbers of assumptions as well as personal judgements to best forecast the future business results, which can only be imagined at the time of budget construction.

In the second activity of budget reporting, all business controllers in all the case companies download various basic reports from the main ERP systems, but they further edit them in spreadsheets. This practice is dominant even with the cases that have access to specific IS technologies for budgeting, such as BI for budgeting (cases A, B, E, F, I, J and K). The Business Intelligence Manager in case K comments on why she still needs spreadsheets for reporting purposes, even though the company has recently invested in the IDeaS BI application: "The BI still has certain calculation limitations. Some things still require a manual grouping [on spreadsheets]. For example, if I want to see the revenues by guest nationality. The [BI] system only provides me with a very general view of guest nationalities and continentals. But I also want to see the information by travel agency. Some travel agencies serve a certain country alone, but some web-based agencies offer flat sales in France, the UK and the US. This type of report cannot be summed on the BI. I have to extract information and sum it manually on Excel [spreadsheets]". The Central Accounting Manager in Case G expresses a similar opinion about their reliance on

spreadsheets in reporting: "We have to consider what our top management wants to see. If they want to see information in a graph format because they understand it better, we provide them with beautiful graphs using spreadsheets. […] It is not like we can press any button [on the ERP system] to get the report that we want. Nothing is that easy. We have to rely on Excel [spreadsheets]." In short, she emphasises that reporting is dependent to a very high extent on managerial information needs. The ERP system in itself cannot respond to such unique needs, so they have to rely on spreadsheets. The CFO in case J comments that spreadsheets are a vital part of budget reporting because users cannot take part in the ERP customisation process. He insists: "There will always be some [reporting] work that needs to be accomplished in Excel [spreadsheets]. It is because the [ERP] system has its own standard. It cannot be customised for us. […] Well, only if we could have taken part in the ERP customisation, but it is not possible. I know it will never be possible".

Spreadsheets are celebrated among business controllers for decision-making related tasks, as it has been shown that they are widely used in budget construction and budget reporting. This is because decision-making is a complicated business process which is highly dependent on personal judgements and preferences as to how best to construct models (such as budgets) and reports to assist the decision-making process. No other IS technologies, whether ERP systems, BI systems or web tools, allow as much flexibility as spreadsheets, as the empirical data has shown. This conclusion does not in any way mean to suggest that the flexibility in spreadsheets is not problematic. The concern that inappropriate use of spreadsheets will lead to poor decision-making raised in the previous research (Redman, 1998 ; Ross, 1996 ; Teo and Tan, 1999) is still valid. However, the flexibility advantages offered by spreadsheets are deemed to exceed the disadvantages inherent in them for the decision-making purposes. Based on the empirical findings, proposition 1A is accepted and proposition 1B is rejected. The next section proceeds to investigate the conflict between spreadsheets and integration in two budget-related activities: budgeting consolidation and budget monitoring.

5.2 Conflict at the activity level: spreadsheets and integration

Integration, defined as the adoption of standardised data definition and structures across IS technologies (spreadsheets, ERP systems and BI) to support budget-related management control, is also needed in budgeting (Abernethy and Brownell, 1999). In relation to the four budgeting activities discussed earlier, (1) budget consolidation and (2) budget monitoring are the two activities which require a high level of integration for management control purposes. These two activities require business controllers to consolidate departmental budgets into a single corporate budget which is used later on for budget monitoring purposes in comparison with the actual operating results.

In the first activity of budget consolidation, spreadsheets are the main IS technologies that business controllers rely on. This practice is similar in all the case companies except for Case B, in which they are trying to employ Cognos BI for budget consolidation. The practice is working in a limited scope since they have not yet implemented Cognos BI in all

affiliated companies. Thus spreadsheets continue to dominate the budget consolidation process. The Planning Vice President in Case B elaborates on the group budget consolidation process: "We get income statements and balance sheet statements from our affiliated companies at the 'load' level. We call it a load because we only get them in the form of Excel [spreadsheets] which do not contain assumptions on how they constructed the entire budgets. We provide them with a [spreadsheets-based] template on key items like revenues, incomes and intercompany transactions because we need this information for budget consolidation. […] As of now, there are about thirty to forty companies that we are still getting the spreadsheets from." The empirical data from the remaining cases shows that it is common for an accounting/finance department to send out an Excel spreadsheets template to related-departments to collect departmental budgets and consolidate a company-wide budget. However, this practice is not without problems, and business controllers in many case companies acknowledge the problem with it. For example, the Head of Accounting in Case A remarks: "The Excel [spreadsheets] for budget consolidation are very large. *No one* is allowed to touch these Excel [spreadsheets]. The file is separated into many business units. They keep cutting and pasting on this file until they get the final budget picture. […] I admit that there are problems [with this practice]. Usually it is like the budgeted balance sheet is not balanced, or something like that. We solve them as they come along." This quotation addresses at least three spreadsheet security concerns. First, it addresses the point that spreadsheets provide neither audit trails nor information tracking (Panko, 2006). Therefore business controllers usually adopt an easy way out by limiting the number of users who have access to spreadsheets. However, research has shown that this practice is not always an effective prevention method (Panko and Halverson, 1997). Second, it suggests that business controllers acknowledge the pitfalls of spreadsheets for consolidation purposes, as the Head of Accounting suggests the problem of an *unbalanced* balance sheet (Kyd, 2007). Third, it shows that companies usually have no plans and policies to manage the spreadsheet risks, as the Head of Accounting suggests that they solve the problems as they appear (Panko and Aurigemma, 2010). Since this study was not primarily set up to detect spreadsheet errors in budget consolidation, there is no information to indicate how, how much and how often these spreadsheets contain errors. However, given an earlier research (Panko, 1998) which concludes that eighty-eight percent of spreadsheets contain errors and the rate of errors tends to accelerate as the spreadsheets grow larger and become more complicated, there is a great tendency for spreadsheet usage for budget consolidation also to contain a high level of errors.

In the second activity of budget monitoring, eight out of the eleven case companies reported the use of spreadsheets for budget monitoring purposes. The three exceptions (Cases A, B and E) are reported to be using ERP systems for this function. The common problem found is that most organisations still have not integrated their management accounting and financial accounting together, despite the fact that the ERP systems that all organisations have access to offer this possibility (Kallunki et al., 2011). Therefore, the common practice for budget monitoring is to download actual financial accounting information into spreadsheets which contain the initial budget information to monitor

budget achievements. Even though the ERP system is used for budget monitoring, variance analysis is conducted in spreadsheets, as the Management Accounting Manager in Case E, which is reported to use the ERP system for budget monitoring, explains the routine variance analysis process at her organisation: "We get the actual [financial information] from the SAP [ERP system]. Then we compare this data from the system to conduct variance analysis in Excel [spreadsheets]". A lack of complete integration between financial and management accounting is observed as a hindrance for the management control function (Chapman and Kihn, 2009). The Business Intelligence Manager in Case K confirms the earlier research conclusion by mentioning that: "It is not always easy to verify the actual information that each property has sent to the headquarters [in comparison with the initial budgets on spreadsheets]. It takes a lot of time. Let's say I have ten properties under my control, it might take me an entire month. By that time I will have to prepare for the next month's work". Apart from the concern for spreadsheet errors that have been addressed in the first activity, the statement made by the Business Intelligence Manager offers a conflicting proposition to the previous research, which indicates that IS technologies have transformed the role of business controllers from *bean counters* to *business partners* (Scapens and Jazayeri, 2003). Use of spreadsheets for management control purposes requires an extensive amount of manual work, which does not allow fruitful exploitation of a business controller's capacities to detect and solve business problems.

Although it is evident and undeniable that spreadsheets are popular IS technologies employed for management control purposes, the analysis in this section sends a strong warning message to practitioners, as well as academia, about the inappropriateness of spreadsheet usage for management control functions in budgeting. The practice is not only astonishingly error-prone but also extremely inefficient for business controllers, as the empirical data has suggested. Other advanced IS technologies such as ERP systems or BI, as well as a proper management and financial accounting integration strategy, should be given serious consideration in order to replace reliance on spreadsheets in the management control function. From the findings, as well as the concerns with the spreadsheet pitfalls presented in this section, proposition 2A is rejected and proposition 2B is accepted. The next section examines the contradiction between spreadsheets and budgeting at the structural level.

5.3 Contradiction at the structural level: spreadsheets and budgeting

This section builds on the concept of contradiction in ST, which is strongly reliant upon the discussions presented in the two previous sections about the conflicts between spreadsheets and flexibility/integration at the activity levels.

Budgeting, which is an established management accounting practice in modern organisations, is portrayed in this study as a social practice which requires continuous flexibility for decision-making and integration for management control. Spreadsheets are shown in the two prior sections to be widely used for the four budget activities (budget construction, budget consolidation, budget monitoring, budget reporting) which belong

equally to the flexibility and integration domains. This study has identified a serious awareness that use of spreadsheets for data integration in the management control function is problematic. This is because such use tends to generate many errors. In addition, other IS technologies, especially the ERP system and BI, are better designed, developed and tested for the management control purpose than spreadsheets.

Figure 1 portrays the overall discussions about the contradiction between spreadsheets and budgeting at the structural level. It depicts the shifts in the role of budget activities from the role of flexibility in the first budget construction activity to the role of integration in the second budget consolidation activity. It also shows that spreadsheets can support budget construction, but that it is inefficient to employ spreadsheets for budget consolidation since other IS technologies (whether the ERP system or BI) have greater potential to support this work function. This is similar to the third monitoring activity in which an automatic integration between financial and management accounting functions, assisted by these advanced IS technologies can properly assist business controllers to constantly observe business operations in relation to the budgets. In the last activity of reporting, budgeting once again changes its role from integration to flexibility in support of business decision-making. Once again, spreadsheets are needed to support this activity because the advanced IS technologies put certain restrictions on the decision-making process.

Figure 1. The contradiction between spreadsheets and budgeting at the structural level
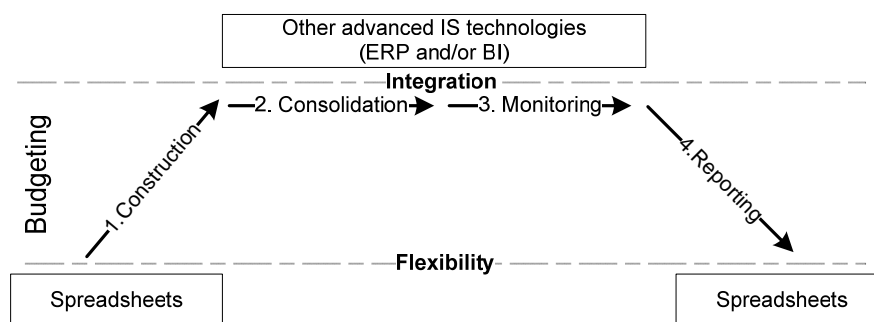
With regard to why spreadsheets are popular among business controllers for budgeting purposes, this study indicates that there are two explanations for this phenomenon. First, the lack of integration between financial and management accounting functions (Chapman and Kihn, 2009 ; Kallunki et al., 2011) is the simple explanation why spreadsheets are popular among organisations. Despite the availability of the ERP systems in all the eleven case companies, only three of the companies are reported to be using the advanced IS technologies for the simple task of budget monitoring. This is not to mention other more complicated tasks like budget construction, in which none of the case companies use these advanced IS technologies to support the entire work process. In most cases, there is a clear disaggregation between the financial and management accounting functions. For example, budget numbers are never entered into the ERP system or the BI. Management accounting functions are often performed *offline*, disconnected and isolated from other work functions. It is supposed that the enormous complexity (Kallinikos, 2004 ; Quattrone

and Hopper, 2005) of these advanced IS technologies hinders a financial and management accounting integration. Second, this study finds that there is a fit/misfit for spreadsheets to support the entire budgeting process. The analysis based on the flexibility domain in decision-making shows that there is a fit between spreadsheets and decision-making activities in budgeting. This is well supported not only by the empirical data shown in this study but also by research results from many publications (Kallinikos, 2004 ; Quattrone and Hopper, 2005 ; Soh et al., 2000). This research shows that the ERP system, for example, is too rigid for decision-making, especially at the local level of organisations. The BI system may prove to be more useful than the ERP system for decision-making (Rom and Rohde, 2006), but the empirical data has shown some system limitations similar to the ERP system. In short, it might be less beneficial for businesses to rely strictly on the ERP system or the BI to support decision-making because these systems tend to put a limit to the decision-making processes. Meanwhile, the analysis based on the integration domain in management control holds that there is a misfit between spreadsheets and the integration domain. However, the misfit view is insufficient to answer why spreadsheets are heavily used for the management control function despite a clear indication that spreadsheets are far from being an ideal IS technology for data integration (Grabski et al., 2011 ; Panko, 2006). Therefore it is posited that that the lack of complete integration between financial and management accounting functions indicated in previous literature (Chapman and Kihn, 2009 ; Kallunki et al., 2011) is the major reason why business controllers rely on spreadsheets instead of the ERP system or BI for the management control function.

6. Conclusions and implications

This paper investigates the use of spreadsheets in budgeting from the concepts of conflict and contradiction in ST in order to explain how and why spreadsheets are used or not used in budgeting practice. Budgeting is deemed as a social practice which entails *flexibility* for decision-making and *integration* for management control Spreadsheets, on the contrary, are an IS technology used to support budgeting. The analysis at the activity level guided by the concept of 'conflict' reveals that spreadsheets are heavily used in all the four main budgeting activities (budget construction, budget consolidation, budget monitoring and budget reporting) in relation to the flexibility and integration domains discussed earlier. The analysis shows that spreadsheets can support flexibility in decision-making because other advanced IS technologies tend to put a limit on what business controllers can do in their decision-making processes. However, the analysis highlights a serious problem with the use of spreadsheets for the integration domain in support of the management control function. This is because spreadsheets are extremely error-prone and inefficient for business controllers. Other advanced IS technologies have a much better capacity to assist the management control function than spreadsheets. The analysis at the structural level concludes that there is a *contradiction* between spreadsheets and budgeting. This is because spreadsheets only have the potential to support the flexibility

domain in decision-making functions, but budgeting constantly requires both flexibility and integration domains. This study offers two explanations as to why spreadsheets are popularly used for budgeting. The first explanation postulates that spreadsheets are continuously used to support the budgeting process due to a lack of complete integration between financial and management accounting functions in the advanced IS technologies like the ERP system. The second explanation posits that spreadsheets are used to support the flexibility in budgeting because they offer a good fit to the flexibility domain for decision-making. Advanced IS technologies like the ERP system or BI seem to put a limitation on business controllers as to what they can and cannot do to support business decisions. However, this view is insufficient to answer why spreadsheets are popularly employed in budgeting despite a misfit between spreadsheets and the integration domain in budgeting. Therefore the lack of integration view is deemed to be superior to the fit/misfit view in explaining the dominant roles of spreadsheets in budgeting.

Clearly, there is more work to be done to validate how these two views can explain the heavy reliance on spreadsheets for budgeting activities. Other views such as power (Markus, 1983) and unfamiliarity (Windschitl and Sahl, 2002) with technologies are also reported in the literature. These dimensions should be explored as well in order to explain the heavy reliance on spreadsheets in management accounting.

This research offers two new insights for the accounting information system (AIS) research community. First, it shows an over-reliance on spreadsheets for management accounting practice. Second, it informs academia and practitioners of the need to reduce their reliance on spreadsheets for the management control functions because of the many drawbacks associated with it. For practitioners, this research sends a strong message to them to reduce their reliance on spreadsheets for the management accounting process. Even though it is probably not possible to totally eliminate reliance on spreadsheets, other advanced IS technologies can be implemented to reduce the role of spreadsheets especially in relation to the management control function. A reduced reliance on spreadsheets surely contributes to information accuracy, which is the major concern in many new regulations governing the twenty-first century organisations, such as the Sarbanes-Oxley Act.

References

Abernethy, M. A. and Brownell, P. (1999). "The role of budgets in organizations facing strategic change: an exploratory study"*, Accounting, Organizations and Society.* Vol. 24, No. 3, pp. 189-204.

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.* Vol. 21, No. 2, pp. 271-301.

Berry, A. J., Coad, A. F., Harris, E. P., Otley, D. T. and Stringer, C. (2009). "Emerging themes in management control: A review of recent literature"*, The British Accounting Review.* Vol. 41, No. 1, pp. 2-20.

Bruns, W. J. and Waterhouse, J. H. (1975). "Budgetary control and organization structure"*, Journal of Accounting Research.* Vol. 13, No. 2, pp. 177-203.

Chapman, C. S. and Kihn, L. A. (2009). "Information system integration, enabling control and performance"*, Accounting, Organizations and Society.* Vol. 34, No. 2, pp. 151-169.

CIMA (2008). "Are you managing your spreadsheet risk?", Chartered Institute of Management Accountants. http://www.cimaglobal.com/Thought-leadership/Newsletters/Insight-e-magazine/Insight-Archive/Are-you-managing-your-spreadsheet-risk/, Acecess date: 14 Feb 2012.

Covaleski, M. A., Evans, H., Luft, J. and Shields, M. (2006). "Budgeting reserach: Three theoretical perspectives and criteria for selective integration ". In Handbook of Management accounting reserach. Vol. II (Chapman, C., Hopwood, A. and Shields, M.,Eds), Elsevier, Oxford p. 587-624.

Croll, G. J. (2009). "Spreadsheets and the Financial Collapse". In Proceedings of the European Spreadsheet Risks Interest Group pp. 145-161. EuSpRIG.

Dechow, N. and Mouritsen, J. (2005). "Enterprise resource planning systems, management control and the quest for integration"*, Accounting, Organizations and Society.* Vol. 30, No. 7-8, pp. 691-733.

Eisenhardt, K. M. and Graebner, M. E. (2007). "Theory building from cases: Opportunities and challenges"*, Academy of Management Journal* Vol. 50, No. 1, pp. 25-32.

Frow, N., Marginson, D. and Ogden, S. (2010). "Continuous budgeting: Reconciling budget flexibility with budgetary control"*, Accounting, Organizations and Society.* Vol. 35, No. 4, pp. 444-461.

Gerring, J. (2004). "What is a case study and what is it good for?"*, American Political Science Review.* Vol. 98, No. 2, pp. 341-354.

Giddens, A. (1979). "Central problems in social theory"*.* University of California press, Barkeley.

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.* Vol. 16, No. 3, pp. 293-311.

Grabski, S., Leech, S. and Sangster, A. (2009). "Management Accounting in Enterprise Resoruce Planning Systems"*.* CIMA Publishing, Oxford.

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.* Vol. 25, No. 1, pp. 37-78.

Granlund, M. (2009). "On the interface between accounting and modern information techonology". Turku School of Economics, Turku.

Granlund, M. (2011). "Extending AIS research to management accounting and control issues: A research note"*, International Journal of Accounting Information Systems.* Vol. 12, No. 1, pp. 3-19.

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

Hansen, S., Otley, D. and Van der Stede, W. (2003). "Practice developments in budgeting: An overview and research perspective"*, Journal of Management Accounting Research.* Vol. 15, No. 95-116.

Hyvönen, T. (2003). "Management accounting and information systems: ERP versus BoB"*, European Accounting Review.* Vol. 12, No. 1, pp. 155-173.

Jean-Baptiste, R. (2009). "Can Accountants Bring a Positive Contribution to ERP Implementation?"*, International Management Review* Vol. 5, No. 2, pp. 82-91.

Jones, M. R. and Karsten, H. (2008). "Giddens's structuration theory and information systems research "*, MIS Quarterly.* Vol. 32, No. 1, pp. 127-157.

Kallinikos, J. (2004). "Deconstructing information packages: Organizational and behavioural implications of ERP systems"*, Information Technology and People.* Vol. 17, No. 1, pp. 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.* Vol. 12, No. 1, pp. 20-39.

Kyd, C. (2007). "Don't Discard Those spreadsheets: The power of Excel-Freindly OLAP "*, Business Performance Management.* Vol. 5, No. 1, pp. 15-20.

Libby, T. and Lindsay, R. M. (2010). "Beyond budgeting or budgeting reconsidered? A survey of North-American budgeting practice"*, Management Accounting Research.* Vol. 21, No. 1, pp. 56-75.

Markus, L. (1983). "Power, politics, and MIS implementation"*, Communications of the ACM.* Vol. 26, No. 6, pp. 430-444.

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

Newman, M. and Westrup, C. (2005). "Making ERPs work: accountants and the introduction of ERP systems"*, European Journal of Information Systems.* Vol. 14, No. 3, pp. 258-272.

Orlikowski, W. J. (1992). "The Duality of Technology: Rethinking the Concept of Technology in Organizations"*, Organization Science.* Vol. 3, No. 3, pp. 398-427.

Panko, R. R. (1998). "What We Know About Spreadsheet Errors "*, Journal of End User Computing.* Vol. 10, No. 2, pp. 15-21.

Panko, R. R. (2006). "Spreadsheets and Sarbanes--Oxley: Regulations, risks, and control frameworks "*, Communications of AIS.* Vol. No. 17, pp. 2-50.

Panko, R. R. and Aurigemma, S. (2010). "Revising the Panko-Halverson taxonomy of spreadsheet errors"*, Decision Support Systems.* Vol. 49, No. 2, pp. 235-244.

Panko, R. R. and Halverson, R. J. (1997). "Are two heads better than one? (At reducing errors in spreadsheet modeling)"*, Office Systems Reserach Journal* Vol. 15, No. 1, pp. 21-32.

Parkinson, L., Coron, L. and Sodarelli, P. (2006). "From Spreadsheets to Real-Time Risk Management "*, Electric Light & Power.* Vol. 84, No. 5, pp. 34-34.

Poole, M. S. and DeSanctis, G. (2004). "Structuration theory in information systems research: Methods and controversies ". In The Handbook of Information Systems

Research(Whitman, M. E. and Woszczynski, A. B.,Eds), Idea Group Publishing, Hershey, PA, p. 206-249.

Power, K. C., Wheeler, B. E., Schulte, D. D. and Meyer, G. E. (1989). "Concepts and applications of database integration with spreadsheet and wordprocessor software packages"*, Computers and Electronics in Agriculture.* Vol. 4, No. 2, pp. 87-102.

PricewaterhouseCoopers (2011). "Spreadsheet Mistakes", PricewaterhouseCoopers. http://www.pwc.com/cy/en/audit-services/assets/pwc-cy_spreadsheet-mistakes-issue1.pdf, Acecess date: 14 Feb 2012.

Quattrone, P. and Hopper, T. (2005). "A 'time–space odyssey': management control systems in two multinational organisations"*, Accounting, Organizations and Society.* Vol. 30, No. 7, pp. 735-764.

Redman, T. C. (1998). "The impact of poor data quality on the typical enterprise "*, Communications of the ACM.* Vol. 41, No. 2, pp. 79-82.

Robey, D. and Boudreau, M.-C. (1999). "Accounting for the Contradictory Organizational Consequences of Information Technology: Theoretical Directions and Methodological Implications"*, Information System Research* Vol. 10, No. 2, pp. 167-185.

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.* Vol. 19, No. 1, pp. 50-66.

Ross, J. A. (1996). "Spreadsheet Risk"*, Harvard Business Review.* Vol. 74, No. 5, pp. 10-12.

Scapens, R., W. and Jazayeri, M. (2003). "ERP systems and management accounting change: opportunities or impacts? A research note"*, European Accounting Review.* Vol. 12, No. 1, pp. 201-233.

Simons, R. (1994). "How New Top Managers Use Control Systems as Levers of Strategic Renewal"*, Strategic Management Journal.* Vol. 15, No. 3, pp. 169-189.

Soh, C., Kien, S. S. and Tay-Yap, J. (2000). "Cultural fits and misfits: Is ERP a universal solution?"*, Communications of the ACM.* Vol. 43, No. 4, pp. 47-51.

Sutton, S. G. (2010). "A research discipline with no boundaries: Reflections on 20 years of defining AIS research"*, International Journal of Accounting Information Systems.* Vol. 11, No. 4, pp. 289-296.

Teo, T. S. H. and Tan, M. (1999). "Spreadsheet development and 'what-if' analysis: quantitative versus qualitative errors"*, Accounting, Management and Information Technologies.* Vol. 9, No. 3, pp. 141-160.

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 pp. 79-105. ICESAL.

Walsham, G. (2002). "Cross-Cultural Software Production and Use: A Structurational Analysis"*, MIS Quarterly.* Vol. 26, No. 4, pp. 359-380.

Walsham, G. (2005). "Learning about being critical"*, Information Systems Journal.* Vol. 15, No. 2, pp. 111-117.

Walsham, G. and Han, C.-K. (1991). "Structuration theory and information systems research"*, Journal of applied systems analysis.* Vol. 18, No. 77-85.

Westley, F. R. (1990). "Middle managers and strategy: Microdynamics of inclusion"*, Strategic Management Journal.* Vol. 11, No. 5, pp. 337-351.

Whittaker, D. (1999). "Spreadsheet Errors"*, Management Accounting: Magazine for Chartered Management Accountants.* Vol. 77, No. 9, pp. 50.

Windschitl, M. and Sahl, K. (2002). "Tracing Teachers' Use of Technology in a Laptop Computer School: The Interplay of Teacher Beliefs, Social Dynamics, and Institutional Culture"*, American Educational Research Journal.* Vol. 39, No. 1, pp. 165-205.