The reference of original published paper & citations required:

E.K. Laitinen, A. Länsiluoto and S. Salonen (2016) Interactive budgeting, product innovation, and firm performance: empirical evidence from Finnish firms. *Journal of Management Control*. Vol. 27 No. 4, pp. 293-322 (DOI: http://dx.doi.org/10.1007/s00187-016-0237-2)

Interactive budgeting, product innovation, and firm performance: empirical evidence from Finnish firms

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Acknowledgments

The contributions of the companies responding to the survey are gratefully acknowledged. We also appreciate the constructive comments of three reviewers and the editor.

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Abstract

Innovation has generally been considered essential to the prosperity of firms. The existing innovation literature does not emphasize budgeting as an important contributor to product innovation, even though it recognizes that poor budgeting may weaken the capability to innovate. However, the budgeting literature suggests that budgets can be used in different ways to improve firm performance. The purpose of this study is to investigate how the frequency of budget preparation and the interactive use of budgets are associated with product innovation and firm performance. The empirical data were collected, through a web-based survey, from CFOs and CEOs in 132 Finnish firms. The results of our partial least squares (PLS) analysis indicate that the frequency of budget preparation positively affects product innovation through interactive budget use, which supports our hypothesis. Furthermore, the frequency of budget preparation and interactive budget use do have a direct positive relationship with firm performance, but one mediated by product innovation. Therefore, this study contributes to the innovation and budgeting literature by showing the frequency of budget preparation and interactive use of budgets to be two separate and important factors in product innovation. The results also show that the relationship between budgets and product innovation and performance are different in defender and prospector firms.

Key words: Budgeting, product innovation, interactive use, firm performance, survey

Highlights

- This study shows that the frequency of budget preparation and the interactive use of budgets affect both product innovation and firm performance.
- Interactive budget use is positively associated with product innovation.
- The frequency of budget preparation has a positive relationship with product innovation when budgets are used interactively.
- The frequency of budget preparation and interactive budget use have a positive relationship with firm performance, but one mediated by product innovation.
- Product innovation has a positive relationship with financial and non-financial performance.
- Interactive budgeting has a positive relationship with product innovation in defender firms but not in prospector firms.
- Budget preparation frequency has a negative relationship with non-financial performance in prospector firms.

Article classification: Research paper

1. Introduction

The ability of a firm to innovate is essential when striving for competitive advantage (Porter 1985). Innovations may be related, for instance, to products, processes, or services (e.g., de Jong and Marsili 2006). This study focuses on product innovation, which is the development and introduction of new or substantially redesigned goods (Dunk 2011). The product innovation focus is justified as these are technical rather than administrative innovations, and hence are easier to observe (Sisaye and Birnberg 2010). While all innovations cannot be immediately converted into financial outcomes, they may be important for a firm's competitive advantage in the future. This indicates that the relationship between product innovations and performance can be complex.

An interesting issue is how new product innovations can be ensured if they are important for firm prosperity. This study focuses on the relationship between budgets and product innovation. The existing innovation literature indicates that the role of budgets in product innovation is debatable since budgeting can have conflicting roles in product innovation (Dunk 2011; Hansen and van der Stede 2004; Jeacle and Carter 2012; Kamoche and Cunha 2001). It may benefit product innovation when applied to identify the targets of development activities, which indicates that they are capable of providing a structure for product innovation (e.g., Kamoche and Cunha 2001). On the other hand, budgets can act as a barrier to product innovation, if for example budgets hinder the emergence of new ideas, inhibit improvisation, or increase uncertainty among managers (see Hansen and van der Stede 2004; Jeacle and Carter 2012; Mouritsen et al. 2009).

The effect of budgets, or any management control systems (MCS), on performance and employee behavior will depend on the way it is used and how they are designed to reflect the specific characteristics of firm. There are several alternative ways of using MCS (e.g., Noguchi and Boyns 2012; Rom and Rohde 2007; Simons 1990; 1994). In this study, our focus is on the interactive use of an MCS. Simons (1990; 1994; 1995; see also Bisbe et al. 2007) proposed that MCSs can be used interactively when they are applied to planning and control procedures to actively monitor and discuss face-to-face meetings about potentially strategic issues. The purpose of interactive systems is to focus attention and allow dialogue and learning to happen throughout an organization.[1]

This study focuses on the concepts of interactive use of budgets and the frequency of budget preparation. The focus on these two concepts is important because the interactive use of budgets is not synonym with the frequency of budget use or the frequency of budget preparation. In interactive use, budgets may be used frequently when budgets are discussed interactively during each face-to-face meeting of managers (Tessier and Otley 2012). However, budgets can also be diagnostically used frequently but discussed only rarely or periodically (for example, annually) when the reasons for budget deviations are analyzed or budgets are prepared for the forthcoming period (cf. Frow et al. 2010; King et al. 2010).

Table 1 illustrates the different concepts of budgeting that are relevant to our study. If a budget is prepared frequently, it can be used either frequently or infrequently. However, if a budget is not prepared frequently, it can still used frequently. This kind of situation occurs for instance when budget targets are set only at the beginning of a year but the variances between budget targets

[1]According to Simons (1994), MCSs can be used either interactively or diagnostically. They are used diagnostically when applied to monitor organizational outcomes and correct deviations from present standards of performance. The purpose of diagnostic systems is to track variances from preset goals and manage by exception (Simons 1994). However, the separation between interactive and diagnostic use might be unclear such as found by Bisbe et al. (2007) who propose interactive control systems to be an ambiguous concept.

and performance are frequently examined during the year (i.e. high diagnostic use). Thus, the frequency of preparation and the frequency of use are different but related concepts. This separation broadens the definition of Bisbe et al. (2007) who do not explicitly separate the frequency of use and preparation. A budget can be used either interactively or diagnostically, and this way of use is independent of the frequency of preparation or the frequency of use (see for instance Frow et. al. 2010; cf. Tessier and Otley 2012). This means that for instance continuous budgeting (i.e. high frequency of preparation) can be used both interactive and diagnostic ways (Frow et al. 2010). Thus, the way of use is a different concept than the frequency of preparation and the frequency of use and should be considered separately.

Table 1. Different concepts of budgeting

Concept								
Frequency of preparation	Frequent				Not frequent			
Frequency of use	Frequent		Not frequent		Frequent		Not frequent	
Way of use	Interactive	Diagnostic	Interactive	Diagnostic	Interactive	Diagnostic	Interactive	Diagnostic

This study focuses on the interactive use of budgets (Simons 1990; 1994; 1995). We have reasons to focus on this type of budgeting. First, prior studies have found that interactive budgeting is an important factor that affects the relationship between product innovation and firm performance (Bisbe and Otley 2004; Dunk 2011). Thus, a focus on the interactive use of budgets makes this study comparable with and able to complement earlier studies (e.g. Bisbe and Otley 2004; Bisbe and Malagueño 2009). Second, in addition to comparability, the interactive type of budgeting is aimed at encouraging dialogue and learning, which are both important characteristics in product innovation (e.g. Henri 2006; Jurado et al. 2008; Simons 1994). Third, interactive controls can be considered as positive controls that try to motivate and reward rather than sanction (Tessier and Otley 2012; Widener 2007). The purpose of this kind of encouragement is to motivate new product innovations.

The purpose of our study is to investigate whether interactive use of budgeting and the frequency of budget preparation are separately associated with product innovation and firm performance. From a theoretical perspective, we use contingency theory (Chenhall 2003) to assist the development of our hypotheses. Partial least squares (PLS) analysis of empirical survey data obtained from CFOs and CEOs in 132 Finnish firms reveals that the frequency of budget preparation is positively associated with the interactive use of budgeting. Furthermore, we find that product innovation mediates the relationship between the interactive use of budgeting and firm performance.

The present study contributes to the existing research in many ways. Firstly, we develop a research model distinguishing the effects of interactive budgeting and frequency of budget preparation on product innovation and performance. If the frequency of budget preparation is not distinguished from the interactive use of budgeting, findings on the interactive budgeting can be biased due to the simultaneous effect of the frequency of budget preparation. Secondly, our study contributes to the literature by investigating whether contingency factors such as size, perceived environmental uncertainty (PEU), and strategy (see Chenhall 2003) affect the relationships between budgeting, innovation and performance described by the research model. Thus, we analyze firstly these relationships in general circumstances and then make use of contingency factors to assess how robust the results are.

The remainder of this paper is organized as follows. We begin by presenting the literature and hypotheses concerning budgeting, innovation, and firm performance. After that, we describe our survey data, statistical methods, and empirical results. Finally, we discuss the results and draw conclusions. The last section summarizes the contribution and discusses limitations of the study.

2. Literature review and hypotheses development

2.1. Research model

A key concept of this study is product innovation. We use Bisbe and Otley's (2004) and Dunk's (2011) definition of product innovation[2] as the development of products that are in some way unique or distinct from existing products. Past studies have proposed that product innovations are primarily affected by a firm's technological competencies (Vega-Jurado et al. 2008). In addition to technological competencies, human resources (i.e., skills and knowledge) and organizational competencies (i.e., administrative styles, formalization of internal communication systems, and the interdependence of work teams) can also be essential factors in product innovation (Vega-Jurado et al. 2008). Furthermore, external factors like industrial characteristics or relationships with external institutions can affect product innovation (de Jong and Marsili 2006; Vega-Jurado et al. 2008; see also Frenz and Ietto-Gillies 2009; Mouritsen et al. 2009). These different factors can be seen important for product innovation and competitive advantage.

In general, a MCS (i.e. budgets in this study) is an important resource that influences decision-making activities, such as product innovation in companies (Malmi and Brown 2008). Kamoche and Cunha (2001) have argued that some social and technical structure is required in improvisational product innovation (see also Tessier and Otley 2012). A budget can provide a technical structure for product innovation, and the way it is used can provide a social structure (Simons 1994; Henri 2006). Having a technical structure would mean for example that the budget functions as a written plan (de Jong and Marsili 2006) in which targets, such as product innovation, are published and converted into monetary terms. The social structure aspect means that the people who participate in budgeting can be seen as a system organized by a characteristic pattern of relationships. This indicates that budgets may help management maintain control during situations of high uncertainty (Frow et al. 2010), such as product innovation. Therefore, budgets and product innovations are essential factors of firm performance.

Figure 1 illustrates the research model that will be estimated for the total sample and separately for the subsamples of three contingency factors. The model anticipates that the frequency of budget preparation and interactive budgeting will be positively associated with product innovation and firm performance. The model predicts that high frequency budget preparation is positively related to the interactive use of the budgets. A high frequency of preparation improves the timeliness of information, which is crucial in the interactive use of budgets. This timeliness improves the quality of interaction and decision-making, leading to better product innovation outcomes. The timeliness of information has been found to be an important factor for the satisfaction of information system (e.g. budget in our study) users (e.g. Doll et al. 1994). Product innovation is expected to be positively associated with performance because it can be considered

[2] There is a difference between firm capabilities/resources and outcomes. Henri (2006) measures innovation as a resource, while Bisbe and Otley (2004), as followed in this study, measures innovation as an outcome. However, Henri (2006) found the interactive use of MCSs to positively influence innovation capability.

a valuable factor required to achieve competitive advantage (Porter 1985). The expected relationships in the research model are analyzed in the following subsections in greater detail.

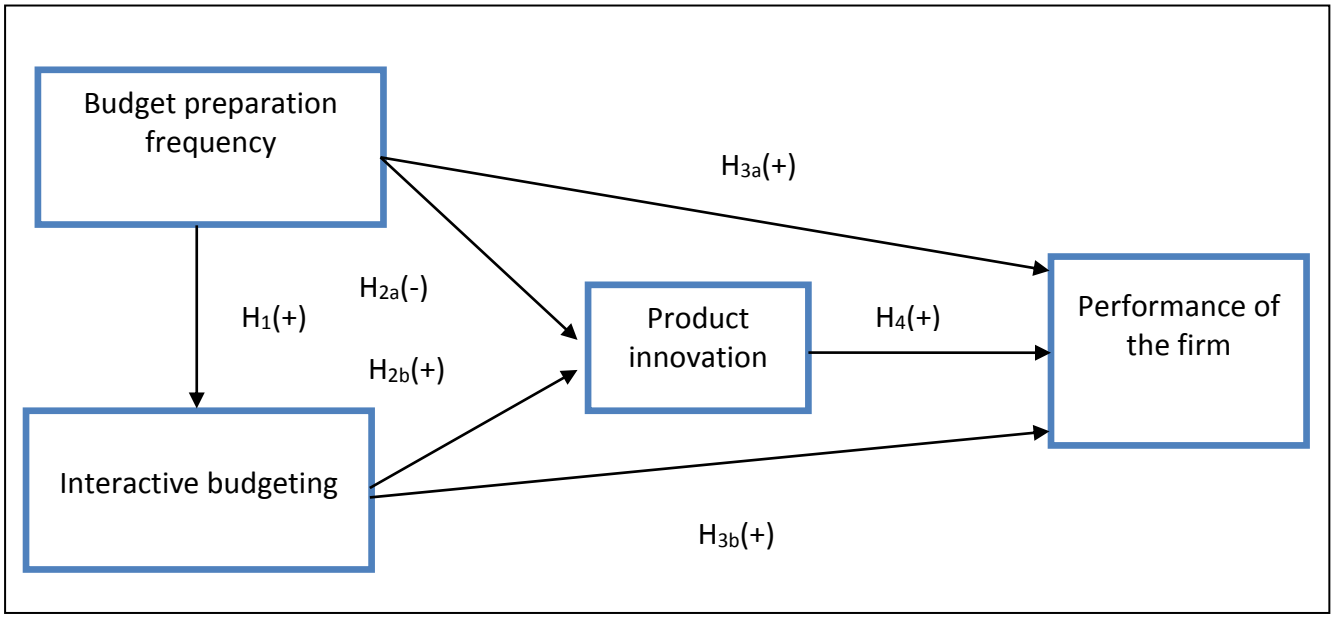

Figure 1. The research model.

2.2. Budget preparation frequency and interactive budgeting

The research model expects that the frequency of budget preparation is positively associated with interactive budgeting (see Tessier and Otley 2012). This means that budgets being prepared frequently facilitate the interactive use of those budgets, for instance, in discussions between managers and subordinates (Simons 1994). However, the diagnostic use of budgeting may also be associated with a high frequency of budget preparation in certain change circumstances. Such circumstances may relate, for instance, to controlling strategic change, ensuring firm liquidity, or identifying and analyzing sales trends. Although both interactive and diagnostic uses of budgets may be associated with a high frequency of budget preparation, more frequent use of budgets is of particular importance for interactive budgeting, so that budgeting data would be more timely. This kind of situation occurs in rolling or continuous budgeting, which is used to ensure that budget information is available in a timely manner (Libby and Lindsay 2010).

In rolling budgeting, the time horizon is usually short, leading to a high frequency of preparation (Hansen and Van der Stede 2004). However, continuous budgeting can be used both diagnostically and interactively (Frow et al. 2010). Despite the different ways budgets are used in continuous budgeting, the process always requires continuous dialogue and face-to-face communication within an organization, which are characteristics of interactive budgeting. In interactive use, new and timely data can be used to facilitate discussions where information is shared, actions developed, and strategies adjusted in changing markets (Simons 1995). In summary, it can be expected that a high budget preparation frequency improves the timeliness of information, which is important for the interactive use of budgets.

Furthermore, the end-user computing satisfaction literature (see Doll et al. 1994) proposes that timeliness of information is one important factor ultimately affecting user satisfaction and information use. In the context of budgets, a high frequency of budget preparation can improve the quality of the budget information when the timeliness improves. A high frequency of budget

preparation may improve information quality, particularly in conditions where environmental uncertainty is high and changes in the competitive environment occur rapidly and unexpectedly. In general, interactive budgeting becomes more effective when information quality, in terms of the timeliness of information, improves as a result of higher frequency of budget preparation. Thus, in terms of the end-user computing satisfaction literature (Doll et al. 1994), a higher frequency of budget preparation increases user satisfaction from the perspective of information timeliness, which leads to greater budget information use in interactive budgeting. Therefore, our hypothesis 1 (H1) is as follows:

> H1: There is a positive association between the frequency of budget preparation and the interactive use of budgets.

2.3. Budgeting and product innovation

Previous studies have investigated the relationship between MCSs (i.e. budgeting in our study) and product innovation (e.g. Chenhall et al. 2011; Davila et al. 2009; de Jong and Marsili 2006). There are studies indicating that budgets might contribute to product innovation. Some studies have proposed that a MCS may offer a beneficial technical structure that supports and directs product innovation (Davila et al. 2009). Chenhall et al. (2011) found that a MCS positively influenced innovation in Russian firms. A MCS may include a written plan, which can improve product innovation particularly when the plan has explicit targets and milestones that are defined and written (de Jong and Marsili 2006). In addition, budgeting can provide a social structure that supports innovation (Simons 1994; Henri 2006). Budgeting may also benefit product innovation when applied to identify the targets of development activities indicating that they are capable of providing a structure for product innovation (Kamoche and Cunha 2001). Therefore, frequent budget preparation can be beneficial for product innovation when synthesizing the findings of Chenhall et al. (2011), Davila et al. (2009), de Jong and Marsili (2006), Kamoche and Cunha (2001), and Henri (2006).

However, existing innovation literature indicates that the role of budgets in product innovation is debatable (Dunk 2011; Hansen and van der Stede 2004; Jeacle and Carter 2012; Kamoche and Cunha 2001). There are indications that budgeting can be harmful to product innovation too. Budgets can act as a barrier to product innovation, if they for example hinder the emergence of new ideas, inhibit improvisation, or increase uncertainty among managers (see Hansen and van der Stede 2004; Jeacle and Carter 2012; Mouritsen et al. 2009). The negative relationship between the frequency of budget preparation and product innovation can also be approached from the perspective of resources. Both budget preparation and product innovation processes require the time of employees, which is a limited resource. This indicates that if employees are preparing budgets more frequently, they have less time for other tasks such as product innovation. Although literature provides mixed evidence, we propose the following hypothesis (H2a):

> H2a: There is a negative association between the frequency of budget preparation and product innovation.

Budgets can, as discussed earlier, be used either diagnostically or interactively (Simons 1994) for different purposes such as operational planning, performance evaluation, communication of goals, and strategy formation (Hansen and Van der Stede 2004; Libby and Lindsay 2010; Simons 1990;

1994; Tessier and Otley 2012). In this study, we focus on the interactive use of budgeting, which may direct organizational attention to focus on strategic uncertainties and thereby aid organizational learning (Simons 1990; 1994; Widener 2007). Interactive controls can be considered positive controls with the purpose of motivating rewarding and enhancing learning as opposed to negative controls intended to sanction (Tessier and Otley 2012; Widener 2007). Therefore, an interactive MCS forms a social structure and fosters dialogue within an organization (Simons 1994; Henri 2006). Evidence shows that dialogue and co-operation among different people are important in product innovation because they foster sharing and challenging new ideas (Vega-Jurado et al. 2008).

Knowledge sharing and dialogue are essential requirements for learning, which is in turn a prerequisite of product innovation (Jensen et al. 2007). This kind of dialogue can be strengthened by using the MCS interactively because it can enhance dialogue and social interaction (Henri 2006; Mouritsen et al. 2009; Tessier and Otley 2012). This indicates that the interactive use of budgets would have the potential to stimulate dialogue and learning in the product innovation context (Henri 2006). Overall, learning has been found to have a statistically significant positive effect on product innovation (Jiménez-Jiménez and Sanz-Valle 2011).

Many studies have investigated the relationship between the interactive use of MCS and innovation (Bisbe and Otley 2004; Bisbe and Malagueño 2009; Dunk 2011; Henri 2006). Bisbe and Otley (2004) found no relationship between the interactive use of budgets and innovation when all the data were analyzed. However, they found a negative relationship between the interactive use of budgets and innovation when the data on only highly-ranking innovators were analyzed. Later Bisbe and Malagueño (2009) found that the interactive use of budgets was affected by the mode of innovation management. Their results showed that budgets were most often used interactively in the strategic/non-expert innovation mode (Bisbe and Malagueño 2009). A recent study of Bisbe and Malaqueño (2015) found that interactive control systems had a positive impact on the innovation process (i.e. organizational creativity, coordination, knowledge sharing and filtering stages) in entrepreneurial oriented organizations.

On the other hand, Dunk (2011) observed no correlation between budget use as a planning mechanism and product innovation. Henri (2006) found that the interactive use of MCS was positively associated with innovativeness. In contrast to our study, Henri (2006) focused primarily on performance measurement systems (PMS) rather than budgeting, which has to be noted when interpreting his results. To summarize, the studies of Bisbe and Otley (2004), Bisbe and Malagueño (2009; 2015), Dunk (2011), and Henri (2006) illustrate that the relationship between the interactive use of budgeting and product innovation is complex.

Although the evidence is mixed, we propose a positive relationship between interactive budgeting and product innovation. This is because interactive budgeting may improve learning and dialogue, which are important as parts of the social structure within the product innovation process. Therefore, we propose the following hypothesis (H2b):

> H2b: There is a positive association between interactive use of budgets and product innovation.

2.4. Budgeting and performance

The ultimate purpose of any MCS is to improve the performance of an organization (Mouritsen et al. 2009). This argument also holds for budgeting. There is empirical evidence that firms with a written budget deliver stronger performance (King et al. 2010). One reason for the positive relationship between budgeting and performance is that the existence of a budget can legitimate the importance of performance (see Jeacle and Carter 2012). This means that budgets can help to curtail poorly performing projects in their infancy, which may ultimately improve overall performance at the firm level.

The frequency of budget preparation has been found to affect firm overall performance (Dunk 2011; Hansen and van der Stede 2004). Studies have shown that when budgets are frequently prepared for operational planning and strategy formation, there is a positive association with organizational unit performance (Hansen and van der Stede 2004). Dunk (2011) found a positive relationship between budget use and financial performance when budgets were intensively and frequently applied to planning during product innovation processes. Therefore, we present the following hypothesis:

> H3a: There is a positive association between the frequency of budget preparation and firm performance.

Besides the frequency of budget preparation, interactive budgeting may have a separate effect on performance. One purpose of interactive budgeting is to improve learning, as proposed earlier. Jiménez-Jiménez and Sanz-Valle (2011) found that learning and performance had a positive relationship, but they did not focus particularly on budgeting. In the context of budgeting, empirical evidence suggests that the interactive use of budget participation and budget emphasis has positive effects on managerial performance (Lau et al. 1997). This indicates that interactivity enables an organization to respond, for instance, to changes in demand conditions or business circumstances without delay. These changes will have effects on several activities in a firm including production, raw-material purchasing, and research and development activities. The interactive use of budgets enables the immediate communication of these changes to different stakeholders in a firm. Therefore, we predict the following positive relationship between interactive budgeting and firm performance:

> H3b: There is a positive association between the interactive use of budgets and firm performance.

2.5. Innovation and performance

There are reasons why product innovations can lead to stronger performance (e.g., Jiménez-Jiménez and Sanz-Valle 2011; Roberts 1999). First, new products can be priced higher if they meet the needs of customers better than existing products do. This means that if a firm has a high number of product innovations, it is able to respond to new challenges and market opportunities better than a non-innovative firm (Jiménez-Jiménez and Sanz-Valle 2011). Second, an innovative new product faces low competition when launched; therefore, it has a good chance of delivering

respectable profits and market share (Roberts 1999). Finally[3], newly innovated products can be cheaper to produce than their predecessors if the material or production efficiency is improved. To summarize, product innovations help firms to achieve higher performance by increasing market share, improving revenue, and decreasing costs. Therefore, we propose the following hypothesis:

> H4: There is a positive association between the level product innovation and firm performance.

2.6. Effect of contingency variables

The research hypotheses H1-H4 on budgeting are drawn for general conditions. However, it is expected that several contingency variables may affect budgeting (Chenhall 2003). Therefore, it can be that the overall results are not generally robust but dependent on the characteristics of the sample considered. In this study, we concentrate on analyzing the impacts of three contingency variables on the research model parameters: Perceived Environmental Uncertainty (PEU), size, and strategy (e.g. Becker et al. 2015). Previously, we have already shortly referred to the budgeting effects of PEU and strategy.

First of all, PEU may affect budgeting in many ways helping management maintain control under high uncertainty (Frow et al. 2010). Ezzamel (1990) showed that high PEU is associated with an emphasis on budgets for evaluation and required explanation of variances but also interactions between superiors and subordinates. Recently, Becker et al. (2015) found that economic crisis in 2008 increased budgeting role in planning and resource allocation but decreased its role in performance evaluation. The budgets have been criticized that traditional budgets are even unsuitable for firms which have high uncertainty (see Frow et al. 2010) because they may become quickly out of date (Libby and Lindsay 2010). In the context of PMS, Widener (2007) found that these systems were used interactively in a high competitive uncertainty but not either technological or operational uncertainties. To summarize, PEU has consequences for budgeting and its use.

In addition to PEU, it is also possible that different types of controls will be appropriate within firms of different size (Chenhall 2003). Merchant (1981) showed that budgeting is used differently in firms. Larger firms made relatively high use of more formal administrative, as opposed to interpersonal, controls. Budgeting was also more positively linked with performance in larger firms. However, the budgeting process has been found to be longer in larger firms (Libby and Lindsay 2010) which indicates more interaction and higher complexity in budget preparation. In addition to budgets, the larger firms may apply also other modes of formal control systems more

[3] The linkage between firm innovation and performance can be justified also by the RBV of the firm (Barney et al. 2001; Porter 1985; Henri 2006). The competitive advantage of a company is based on capabilities that are difficult to duplicate and substitute (Barney et al. 2001; Henri 2006). The capability to innovate products is an example of such capabilities, and there is evidence that it is positively correlated with overall performance (Bisbe and Otley 2004), and specifically with financial performance (Dunk 2011).

extensively whereas informal control systems can fulfill the managerial requirements in smaller firms (Chenhall 2003). All in all, firm size has been found to have impact on budgeting.

The third contingency factor which may have effect on budgeting is a strategy type. Miles and Snow (1978) classified strategies according to innovation focus. Prospector strategies are focused on continued innovation whereas defender strategies emphasize cost control, operational efficiency, and price competition issues. Thus, firms with prospector strategies seem to place greater emphasis on product innovation processes than firms with defender strategies. However, Bisbe and Otley (2004) showed that an interactive use of MCS favors innovation only in low-innovating firms, while the effect is in the opposite direction in high-innovating firms. In general, contingency research suggests that the defender strategy is more strongly associated with formal, traditional MCSs such as budgets than an innovation (prospector) strategy (Chenhall 2003). This indicates that budgets are likely to be prepared more frequently in firms that do not rely on product innovation power as a source of competitive advantage. Furthermore, the use of the various strategic management accounting practices has been found to be more strongly related to firms with innovative prospector strategies (Cadez and Guilding 2008). Usually, these strategic management accounting practices do not incorporate budgets (Cadez and Guilding 2008). These studies indicate a negative relationship between frequency of budget preparation and product innovation. Finally, contingency theory has proposed that firms with prospector strategy use budgets rather interactively than diagnostically (Chenhall 2003). These studies indicate that the firm strategy has impact on the budget preparation and its use.

In conclusion, previous studies indicate that contingency factors (e.g. PEU, firm size and strategy in our study) can affect budgeting in many ways. However, to maintain our focus we do not draw detailed hypotheses on the effects of the three factors on the separate links of the research model (Figure 1). We only present the following general hypotheses on the contingency effects:

> H5: Budgeting is (see Hypotheses H1-H4 and research model in Figure 1) affected by a) PEU, b) Firm size and c) Strategy.

3. Data and methods

3.1. Data gathering

The current research relies on a web-based survey that gathered empirical data to test the hypotheses presented above. We followed the suggestions of Dillman (2007) when designing and implementing the questionnaire, before sending it to a randomly selected sample of 500[4] Finnish firms classified as manufacturing companies in the Statistics Finland (2012) records. We limited the sample to firms with more than 50 employees because smaller companies may not need systematic MCSs (such as budgets) for management purposes (see Chenhall, 2003). The firms were selected from the Voitto+ database published by Suomen Asiakastieto Oy (Finska) (http://www.asiakastieto.fi). We sent a link to our web-based questionnaire to each firm's CFO, unless the CFO could not be identified, in which case the survey was directed to the CEO. Potential respondents were contacted through an e-mail that explained the purpose of the research and included a guide for completing the questionnaire.

After sending one reminder, we received 144 responses. However, 12 responses were discarded because the responding firm had fewer than 50 employees. Therefore, we obtained 132 usable responses, representing a response rate of 27%. Responses from early respondents were compared to responses from those who responded after the reminder was sent using the Kruskal–Wallis test and one-way analysis of variance (ANOVA). No statistically significant difference was found between the response groups at a 10% level, which indicates that the timing of responses had no effect on the results. We also tried to diminish the potential for common method bias by allowing respondents to answer anonymously, avoiding vague concepts, and keeping questions simple (see Podsakoff et al. 2003).[5]

Panels A–D in Table 2 provide descriptive statistics of the respondents. The respondents were primarily CFOs (36.4%), financial managers (29.5%), or CEOs (22.7%). They had generally held their current position for less than five years (43.9%). The median firm responding to the survey had 127 employees and a turnover of 22.2 million euros. A significant number of the firms were manufacturers of metal products (20.5%) or of other machinery and equipment (15.2%).

[4]We did not manage to contact 11 respondents, resulting in 489 firms in the final sample. There might be reasons that we did not manage to contact all respondents: we might have had wrong e-mail address, or the respondent may have been absent or not accepted e-mails from unknown senders, or the e-mail might have fallen foul of a junk mail filter.

[5]In addition, we compared the relationships of the model variables in different subsamples and found clear differences as a sign of nonexistence of common method bias. We also applied the unrotated factor analysis to all items of the model and found six separate factors with Eigenvalue over 1 (see Podsakoff et al., 2003).

Table 2. Respondents by their position, experience, size, and industry (n = 132)

Panel A. Position	Frequency	%			
CFO	48	36 %			
Financial manager	39	30 %			
CEO	30	23 %			
Controller	14	11 %			
Office manager	1	1 %			
Panel B. Experience in a current position	**Frequency**	**%**			
Less than 5 years	58	44 %			
5-10 years	29	22 %			
10-15 years	12	9 %			
15-20 years	10	8 %			
More than 20 years	23	17 %			
Panel C. Company size	**Minimum**	**Maximum**	**Mean**	**Median**	**Std. Dev.**
Number of employees	50	17 913	470	127	1 892
Turnover (in Million Euros)	1.07	4 209	112.3	22.24	416
Panel D. Manufacturing industry	**Frequency**	**%**			
Fabricated metal products	27	20.5 %			
Machinery and equipment	20	15.2 %			
Food products	16	12.1 %			
Rubber and plastic products	11	8.3 %			
Wood products	9	6.8 %			
Paper products	7	5.3 %			
Electrical equipment	7	5.3 %			
Other	35	26.5 %			

3.2. Measurement constructs

Budget preparation frequency

The survey used the five-item, 7-point Likert scale instrument of King et al. (2010) to measure the frequency of budget preparation in (operative) budgeting (see Appendix 1, Panel A). King et al. (2010) adapted this instrument from those of Chenhall and Langfield-Smith (1998) and Jänkälä (2005). Larger values indicate more frequent budget preparation. Panel A in Table 3 shows that two factors with eigenvalues of 1.985 and 1.049 were extracted by using a Varimax rotation, which together explain 60.67% of the total variance.[6] We used only Factor 1 (Cronbach's alpha $\alpha = 0.675$) because Factor 2 had low reliability ($\alpha = 0.205$). Furthermore, two of the five items (yearly and weekly budgeting) were deleted from the analysis (OPER1 and OPER5) to obtain the final measure for budgeting preparation frequency (based on OPER2 to OPER4). OPER1 and OPER5 were loaded on Factor 2 and had very low loadings on Factor 1. We included OPER4 in the final construct

[6]We used the orthogonal Varimax rotation throughout the component analyses because it results in linearly independent factors that are easily interpretable and useful in statistical analyses.

although it had higher loading on Factor 2. However, the loading on Factor 1 was quite high and in the unrotated factor analysis it had a loading of 0.646 on Factor 1 and only 0.261 on Factor 2.

Interactive budgeting

Abernethy and Brownell's (1999) instrument was used to investigate the interactive use of budgeting (Appendix 1, Panel B). This instrument has been applied in several different studies, such as Bisbe and Otley (2004), Bisbe and Malagueño (2009), and Chapman and Kihn (2009). However, we added an item (INTER5) from Bisbe and Otley (2004) to Abernethy and Brownell's (1999) instrument, and our instrument accordingly has five items measured on a 7-point Likert scale. According to Panel B of Table 3, factor analysis by a Varimax rotation extracted one component with an eigenvalue of 3.121, which explains 62.43% of the total variance. Cronbach's alpha was 0.847, which indicates high instrument reliability for the construct of interactive budgeting (based on INTER1 to INTER5).

It is questionable if the frequency of budget preparation (OPER2-4) and interactive budgeting (INTER1-5) measure the same issue. However, they are theoretically different factors (e.g., Frow et al. 2010; Tessier and Otley 2012). The frequency of budget preparation focuses particularly on the systematicity of preparation of a specific MCS (i.e., budgeting in our study) whereas the focus of interactive budgeting is on how the MCS is used (see Tessier and Otley 2012). We conducted a factor analysis for these items (OPER2-4 and INTER1-5) that resulted in two different components. These components are exactly same as we applied in our study. The eigenvalues were 3.645 for Factor 1 and 1.443 for Factor 2, which together explain 63% of the total variance.

Product innovation

We applied Jänkälä's (2010) instrument, which is similar to that of Bisbe and Otley (2004) and Bisbe and Malagueño (2009), to measure product innovation (Appendix 1, Panel C). This instrument consists of four items measured on a 7-point Likert scale, where higher values represent greater product innovation. Panel C of Table 3 shows that factor analysis (Varimax rotation) extracted only one component for product innovation, with an eigenvalue of 3.389. This factor explains 84.715% of the total variance in all items. The Cronbach's alpha value was very high ($\alpha = 0.939$) for this construct of product innovation (based on INNO1 to INNO4).

Performance

Finally, we used the instrument developed by Bisbe and Otley (2004)—which has its origins in that of Govindarajan (1984)—to identify performance (Appendix 1, Panel D). The adapted instrument has eight items measured on a 7-point Likert scale where higher values correspond to better performance. The instrument was selected because it measures both financial and non-financial performance in relation to competitors. Panel D of Table 3 shows that factor analysis extracted three components for performance after Varimax rotation with eigenvalues over 1. These factors explain over 80% of the total variance. However, Components 2 and 3 were combined because they both include non-financial, customer-oriented performance measures and their eigenvalues were only 1.36 and 1.02. After this step, Cronbach's alpha values were 0.914 for Component 1 (financial performance based on PERF1 to PERF4) and 0.698 for combined Components 2 and 3 (non-financial performance based on PERF5 to PERF8), which indicates sufficient instrument reliability.

In addition to our findings, there is earlier empirical evidence that Bisbe and Otley's (2004) performance measurement instrument can be divided into non-financial and financial performance (Dunk 2011; see also Chapman and Kihn 2009). Furthermore, non-financial

performance (cause or lead indicators) can later result in financial performance (effect or lagging indicators) as proposed previously by Kaplan and Norton (2001). These theoretical reasons and our empirical findings led us to divide performance into non-financial and financial performance categories.

Contingency factors

The effects of contingency factors on our findings was assessed by estimating the PLS model for several subsamples. These subsamples were based on three contingency variables that are important for innovation and interactive budgeting: PEU, size, and strategy (Henri 2006; Jänkälä 2007; Bisbe & Otley 2004). PEU was measured using the construct originally developed by Govindarajan (1984) and used by Hoque (2005). It consists of eight items (see Appendix 1). PEU was assessed by asking respondents to indicate, on a 7-point Likert scale anchored with *very predictable* (1) and *very unpredictable* (7), their perceptions of the relative predictability of the eight items. The Cronbach alpha for these items was 0.767, which is above the lower limit of normal acceptability. Therefore, a sum variable of the items was constructed to reflect PEU and the sample was split into two parts (low PEU and high PEU) on the basis of the median (3.125).

The second contingency variable used in the subsampling was the size of the firm. It was measured by the number of full-time employees, which is the most-used size measure in management accounting (Chenhall 2003). This measure was used to split the sample into two subsamples (small and large firms) on the basis of median size (126.5). The last variable used in the subsampling was the strategy of the firm. This was measured using a version of the Snow and Hrebiniak (1980) construct based on descriptions of prospector, analyzer, and defender strategies (see Appendix 1). The respondents were asked how which description most closely fit the strategy of their firm on a 7-point Likert scale anchored with *defender* (1) and *prospector* (7). The responses were used to split the sample into two parts (low prospectorship, i.e. defender and high prospectorship i.e. prospector) using the median (four) as a cutoff.[7]

[7]The sample could be split in a way that values 1-2 represent defenders, 3-5 represent analyzers, and 6-7 represent prospectors. However, we did not use these types of subsamples because the responses were not equally represented in all strategy types. There was a small number of responses in two subsamples: nine responses for defenders, 94 responses for analyzers, and 29 responses for prospectors.

Table 3. Descriptive statistics for items and principal component analysis[8] (n = 132)

	Descriptive statistics			Factor loadings		
Panel A (Budget preparation frequency)	Mean	Median	SD	Factor 1	Factor 2	
OPER1	6.75	7	0.984	0.104	0.642	
OPER2	3.15	1	2.522	0.867	0.041	
OPER3	3.86	4	2.595	0.895	0.116	
OPER4	5.15	7	2.485	0.428	0.550	
OPER5	1.73	1	1.63	-0.048	0.744	
Eigenvalue (% of variance)				1.99 (39.70%)	1.05 (20.97%)	
Panel B (Interactive budgeting)	Mean	Median	SD	Factor 1		
INTER1	4.95	5	1.757	0.788		
INTER2	4.93	5	1.774	0.774		
INTER3	5.01	5	1.714	0.883		
INTER4	3.95	4	1.796	0.734		
INTER5	5.03	5	1.707	0.764		
Eigenvalue (% of variance)				3.12 (62.14%)		
Panel C (Product innovation)	Mean	Median	SD	Factor 1		
INNO1	4.11	4	1.737	0.901		
INNO2	3.87	4	1.673	0.937		
INNO3	3.55	4	1.622	0.942		
INNO4	3.70	4	1.670	0.901		
Eigenvalue (% of variance)				3.39 (84.72%)		
Panel D (Performance)	Mean	Median	SD	Factor 1	Factor 2	Factor 3
PERF1	4.52	4	1.305	0.692	0.497	0.011
PERF2	4.25	4	1.416	0.898	0.142	0.152
PERF3	4.20	4	1.374	0.923	0.056	0.200
PERF4	4.27	4	1.409	0.900	0.112	0.199
PERF5	4.29	4.5	1.251	0.410	0.777	0.086
PERF6	5.11	5	0.938	0.148	0.063	0.901
PERF7	5.35	5	0.949	0.196	0.271	0.780
PERF8	4.49	5	1.156	-0.034	0.842	0.258
Eigenvalue (% of variance)				4.07 (50.87%)	1.36 (17.02%)	1.02 (12.70%)

3.3. Descriptive statistics

Table 4 illustrates the descriptive statistics (Panel A) and Pearson correlations (Panel B) for the model variables that were constructed by averaging the selected items (without any weighting). In general, the statistics in Panel A show that the means of these constructs (averaged variables) are

[8] We used a Varimax rotation of factor analysis in Panels A-D.

quite high but the ranges are large. The innovation variable had the lowest mean and median values. According to Panel B in Table 4, budget preparation frequency (OPER2-4) is positively associated with interactive budgeting (INTER1-5) (r = 0.403, p = 0.000), which has a positive relationship with product innovation (INNO1-4) (r = 0.193, p = 0.027). Product innovation also has significant positive correlations with financial (PERF1-4) (r = 0.305, p = 0.000) and non-financial (PERF5-8) (r = 0.398, p = 0.000) performance. Finally, both frequency of budget preparation and interactive budgeting have a non-significant association with both financial and non-financial performance. To conclude the correlation analyses, they provide preliminary support for H1, H2b, and H4, but H2b and H3 are not supported by the correlation analysis.

Table 4. Descriptive statistics for the variables as averages of items (n = 132)

Panel A. Mean, median, standard deviation, and ranges

No.	Sum variable	Mean	Median	SD	Theoretical	Actual
1.	OPER2-4	4.05	4.33	1.976	1-7	1-7
2.	INTER1-5	4.77	5	1.379	1-7	1-7
3.	INNO1-4	3.81	4	1.541	1-7	1-7
4.	PERF1-4	4.31	4.25	1.228	1-7	1-7
5.	PERF5-8	4.81	5	0.783	1-7	2.5-6.5

Panel B. Pearson correlation coefficients

No.	Sum variable	1.	2.	3.	4.	5.
1.	OPER2-4	1				
2.	INTER1-5	0.403**	1			
3.	INNO1-4	-0.021	0.193*	1		
4.	PERF1-4	0.024	0.062	0.305**	1	
5.	PERF5-8	-0.097	0.070	0.398**	0.498**	1

* p < 0.05, ** p < 0.01 (two-tailed)

3.4. Data analysis

PLS was applied to test the hypotheses in our research model. PLS has been used in earlier MCS studies (e.g., Chapman and Kihn 2009; Fayard et al. 2012; Lee et al. 2011) because it has some advantages over other structural equation modeling techniques (see Henseler et al. 2009; Lee et al. 2011; Smith and Langfield-Smith 2004). PLS is especially useful when the sample size is limited. In addition, it can accommodate non-normal data due to the less rigorous assumptions underpinning the technique (Smith and Langfield-Smith 2004; Henseler et al. 2009). Therefore, PLS is useful for this study, which has only 132 usable responses in total and subsamples with numbers of responses varying from 58 to 74.

Table 5 shows several quality measures for the PLS model. For all latent variables, the average variance extracted (AVE) exceeds 0.5, composite reliability exceeds 0.8, and Cronbach's alpha exceeds 0.6. The majority of the loadings are over 0.7, except for three items (INTER4, PERF6, and PERF7). PERF6 has the lowest loading, 0.562. Together, these values indicate satisfactory reliability and construct validity (Lee et al. 2011; see also Chapman and Kihn 2009; Fayard et al. 2012).

Table 5. Loadings in PLS and reliability of constructs

	Loadings	AVE	Composite Reliability	Cronbach Alpha
A. Budget preparation frequency		0.599	0.816	0.675
OPER2	0.704			
OPER3	0.842			
OPER4	0.769			
B. Interactive budgeting		0.622	0.891	0.848
INTER1	0.818			
INTER2	0.772			
INTER3	0.868			
INTER4	0.698			
INTER5	0.778			
C. Product innovation		0.847	0.957	0.940
INNO1	0.903			
INNO2	0.941			
INNO3	0.939			
INNO4	0.898			
D. Performance				
Financial performance		0.795	0.939	0.913
PERF1	0.809			
PERF2	0.900			
PERF3	0.931			
PERF4	0.922			
Non-financial performance		0.516	0.807	0.705
PERF5	0.803			
PERF6	0.562			
PERF7	0.670			
PERF8	0.809			

5. Empirical results

5.1. Statistical methods used

We used the SmartPLS software package (http://www.smartpls.de/) to test the hypotheses. For statistical testing, we used bootstrapping (with 500 subsamples) to test the statistical significance of each path coefficient (see Fayard et al. 2012; Lee et al. 2011; Chapman and Kihn 2009). As suggested by Chapman and Kihn (2009), each bootstrap subsample consisted of the same number of cases as our original sample (n = 132). In addition, we also used bootstrapping separately to assess the significance of the mediation effects in the model (see Preacher and Hayes 2008). The

empirical results are summarized in Tables 6 and 7 and illustrated in Figure 2. Table 6 presents the correlations between the PLS latent variables. Table 7 shows the standardized path coefficients. The correlations are comparable with the Pearson's correlation coefficients presented in Table 4 (Panel B) for the averaged sum variables.

Table 6. Correlations of latent variables from PLS (n = 132)

No.	Variable	1.	2.	3.	4.	5.
1.	Budget preparation frequency	1				
2.	Interactive budgeting	0.436	1			
3.	Product innovation	-0.014	0.187	1		
4.	Financial performance	0.019	0.059	0.314	1	
5.	Non-financial performance	-0.089	0.085	0.421	0.495	1

5.2. PLS in different performance measures

The path coefficients in Table 7 indicate a strong, positive association between budget preparation frequency and the interactive use of budgets (β = 0.436 p < .001), which supports H1.[9] The relationship between budget preparation and product innovation is not significant (β = -0.118, p > .1) and thus H2a is not supported. Interactive budgeting shows a positive and statistically significant association with product innovation (β = 0.238, p < .05), which supports H2b. Performance is not affected directly by budget preparation frequency or interactive budgeting. This means that H3a and H3b are not supported. Finally, product innovation shows a positive association with financial performance (β = 0.317, p < .001) and non-financial performance (β = 0.410, p < .001), which provides empirical support for H4.

Table 7. Standardized path coefficients from PLS analysis (n = 132)

	Paths from			
Paths to	Budget preparation frequency	Interactive budgeting	Product innovation	Multiple R^2
Interactive budgeting	0.436***			0.190
Product innovation	-0.118	0.238**		0.046
Financial performance	0.029	-0.013	0.317***	0.099
Non-financial performance	-0.107	0.055	0.410***	0.187
* p < 0.1, ** p < 0.05, *** p < 0.001 (two-tailed test)				

We also tested if the results differ when performance is measured by one aggregate component or by three different dimensions (presented in Table 3 Panel D). The results were similar, as presented in Table 7. Panel A in Table 8 shows similar results as in Table 7 when the aggregate measure of performance was used. According to Panel B in Table 8, the only difference compared to Table 7 is that product innovation had a higher impact on non-financial performance component 2 (β = 0.430, p < .001) than on non-financial component 3 (β = 0.195, p < .1) when

[9]We also estimated the PLS model without INTER1and INTER2 to assess their effect on the relationship between budget preparation frequency and the interactive use of budgets. The resulting path coefficient was 0.376 instead of the original coefficient 0.436, but this did not affect our conclusions.

performance had three dimensions (i.e. financial, non-financial1 (items 5&8), and non-financial2 (items 6-7)). Despite the different coefficients between product innovation and performance, they all are positive and statistically significant and thus supports H4. Therefore, different performance (i.e., aggregate or specific) measures do not affect the results.

We also tested the mediation effects using a bootstrapping method to assess statistical significance. These analyses showed that the indirect effect of budget preparation on performance through product innovation is statistically insignificant. However, the indirect effect of interactive budgeting on both financial and non-financial performance through innovation is weak but statistically significant at p-levels 0.080 and 0.065 (two-tailed significance) respectively.

Table 8. Path coefficients from PLS analysis (n = 132) for a) aggregate performance and b) three dimensions for performance

Panel A	Paths from			
Paths to	Budget preparation frequency	Interactive budgeting	Product innovation	Multiple R2
Interactive budgeting	0.437***			0.191
Product innovation	-0.118	0.238**		0.046
Performance (aggregate)	-0.040	0.022	0.417***	0.179
* p < 0.1, ** p < 0.05, *** p < 0.001 (two-tailed test)				
Panel B	Paths from			
Paths to	Budget preparation frequency	Interactive budgeting	Product innovation	Multiple R^2
Interactive budgeting	0.430***			0.185
Product innovation	-0.119	0.239**		0.047
Financial performance	0.031	-0.013	0.317***	0.100
Non-financial performance I	-0.067	0.057	0.430***	0.199
Non-financial performance II	-0.135	0.024	0.195**	0.057
* p < 0.1, ** p < 0.05, *** p < 0.001 (two-tailed test)				

5.3. Impact of contingency factors

Table 9 presents the estimated path coefficients in subsamples to assess the effect of PEU, size, and strategy on the links between the model variables. The empirical analyses show that the frequency of budget preparation has only an insignificant effect on product innovation and financial performance in each subsample. However, budget preparation frequency has a significant positive association with interactive budgeting in all subsamples except for that of low prospectorship describing a defender. This association is exceptionally strong for the high prospectorship subsample. Budget preparation frequency has an insignificant association with non-financial performance, except for prospectors with a negative path coefficient. Thus, high budget preparation frequency has a negative effect on non-financial performance in prospector firms.

Interactive budgeting does not show a significant relationship with financial or non-financial performance in any subsample. The positive relationship between interactive budgeting and product innovation found in the total sample can be identified only in the subsample of low prospectorship (i.e. defender firms). Product innovation is positively associated with financial performance in all subsamples. However, product innovation has an insignificant association with non-financial performance in the subsample of defenders. Thus, strategy subsamples show quite

different results than other subsamples and the total sample, indicating that innovation and interactive budgeting play different roles in defender firms.

Table 9. Path coefficients in different subsamples

	Path coefficients:						
	Total sample	PEU		Size		Prospectorship	
		Low	High	Small	Large	Defender	Prospector
Path							
Budget preparation frequency → Product innovation	-0,118	-0,021	-0,228	-0,025	-0,256	0,027	-0,200
Budget preparation frequency → Interactive budgeting	0,436***	0,470***	0,432**	0,457***	0,422***	0,250	0,600***
Budget preparation frequency → Financial performance	0,029	-0,082	0,137	-0,031	0,067	0,100	-0,035
Budget preparation frequency → Non-financial performance	-0,107	-0,160	-0,042	-0,152	-0,060	0,085	-0,270**
Interactive budgeting → Product innovation	0,238**	0,156	0,137	0,210	0,212	0,253**	0,180
Interactive budgeting → Financial performance	-0,013	-0,048	-0,095	0,071	-0,104	0,038	-0,028
Interactive budgeting → Non-financial performance	0,055	0,185	-0,171	0,216	-0,123	0,066	0,137
Product innovation → Financial performance	0,317***	0,240*	0,326***	0,308**	0,324***	0,256**	0,313**
Product innovation → Non-financial performance	0,410***	0,348**	0,387***	0,417***	0,380***	0,239	0,485***
Number of firms	132	67	65	66	66	74	58
* p < 0.10, ** p < 0.05, *** p < 0.01 (two-tailed test)							

5.4. Summary of empirical results

To summarize the empirical analysis: the PLS analysis did not offer any empirical support for a direct relationship between budget preparation frequency, interactive use of budgets, and financial or non-financial performance. Therefore, H3a and H3b can be rejected. Furthermore, budget preparation frequency and product innovation had the negative association (β = -0.118) that H2a predicts, but this relationship is statistically insignificant (p = 0.285). Figure 2 summarizes the estimated PLS model and shows only the statistically significant coefficients between variables. Based on the empirical analysis, H1 (i.e. there is a positive association between the frequency of budget preparation and the interactive use of budgets), H2b (i.e. there is a positive association between interactive use of budgets and product innovation) and H4 (i.e. there is a positive association between the level product innovation and firm performance) are supported. Empirical evidence on the impacts of the contingency factors showed that PEU (H5a) and size (H5b) did not significantly affect these general results. However, strategy had a strong impact on several links of the research model supporting H5c.

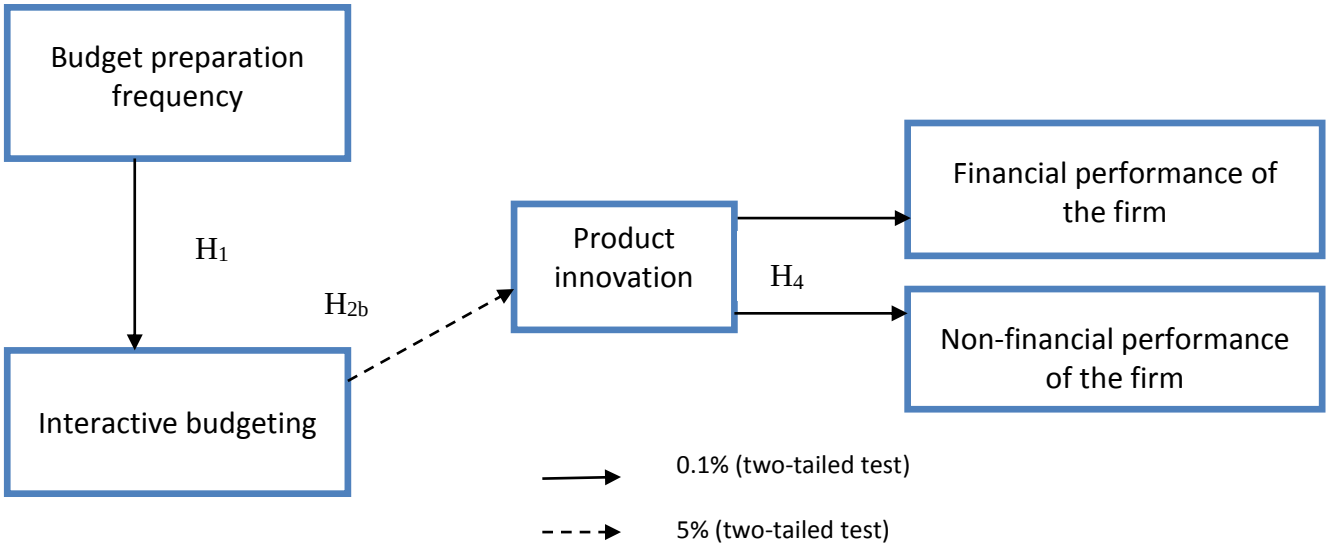

Figure 2. PLS model: Budgeting, product innovation, and performance (n = 132, only statistically significant paths shown).

5.5. Discussion

The current study investigated how budgeting is associated with product innovation and firm performance. We used PLS to analyze both direct and mediating relationships between these variables. As expected, interactive budgeting was positively associated with product innovation. This finding indicates the importance of the way in which budgets are used. If budgets are used interactively to increase dialogue and form a social structure, they have a positive impact on product innovation. This kind of dialogue is important in product innovation because it allows new ideas to emerge and existing ideas to be improved during discussion, which is essential for interactive budgeting. Therefore, the budgets can provide a technical structure (i.e. preparation of budgets in our study) for the product innovations (Kamoche and Cunha 2001). Furthermore,

budgets seem to provide also a social structure (i.e. interactive use of budgets in our study) for the innovation (Kamocha and Cunha 2001 see also Davila et al. 2009: Henri 2006; Simon 1994) which forces interaction in the product innovation process by resulting finally the higher number of product innovations.

However, no direct relationship between the interactive use of budgets and performance was found, which was contrary to our expectations. One possible reason for this is that the context in which budgets are used may be important. This indicates that interactive use alone is not an important determinant of performance. In some cases, interactive use may even decrease performance if an excessively high degree of intensity of use is required for decision-making purposes. A high degree of intensity of use may even delay necessary decisions (such as ceasing production or stopping deliveries to unprofitable customers), and such delays can adversely affect performance (e.g., Baum and Wally 2003).

However, in some decision-making situations (such as product innovation), interaction may improve performance. The combination of these positive and negative effects of interaction may explain why interactive budgeting was not directly associated with performance in our study. Therefore, our finding regarding the context of budgeting supports and extends the findings of Henri (2006), who determined that the interactive use of a PMS had no direct relationship with firm performance. We recommend continuing the investigation of this hypothesized but unproven relationship in future studies.

Contrary to expectations, budget preparation frequency had no direct association with product innovation or firm performance. One reason for this may be that operative budgets are not specifically constructed for the purposes of assigning responsibilities in product innovation. Budgets might be constructed for general management purposes at the company level rather than for the specific purpose of promoting innovation (see, de Jong and Marsili 2006). However, the results showed that budget preparation frequency is positively associated with the interactive use of budgets, which supports H1. Thus, the interactive use of budgets is linked to the frequent and systematic preparation of operative budgets (cf. Tessier and Otley 2012). The interactive use of budgets may require intensive preparation of budgets or vice versa (intensive budget preparation may require interactive use of budgets).

The results also show a positive association between product innovation and performance, supporting H4. Product innovation is positively related to both non-financial and financial performance, which indicates the viability of the prospector-type strategy. In our study, non-financial performance is expressed as customer-oriented performance. The relationship between innovation and non-financial performance was stronger, which may indicate that customers are sole source of product innovation (see de Jong and Marsili 2006). Firms attempt to satisfy customer needs through innovative new products and, therefore, product innovation is more strongly related to non-financial measures. It may be that product innovation initially improves non-financial performance (such as customer-related performance), and this improved non-financial performance leads to improved financial performance.

Finally, the results indicate that contingency variables have some effect on the examined relationship (see Chenhall 2003). We split the data according to the perceived environmental uncertainty, firm size, and strategy type. The results did not differ in different subsamples except in the case of strategy type. Compared to the prospector firms, the defender firms did not have significant relationships between budget preparation frequency and interactive budgeting or between product innovation and non-financial performance. However, interactive budgeting

benefits product innovation only in defender firms and not in prospector firms. This shows interactive budgeting to be an important mechanism in defender firms when they are pursuing the development of innovative new products; an extension to the results of Bisbe and Otley (2004). Bisbe and Otley (2004) did not find a significant relationship between interactive budgeting and innovation among low innovators, but their analysis included only 20 firms. Interactive budgeting can be used for learning and improving dialogue, which are important factors in product innovation (Simons 1994 see also Henri 2006; Jensen *et al*. 2007; Jiménez-Jiménez and Sanz-Valle 2011).

Unlike defender firms, prospector firms seem to have tools other than interactive budgeting for product innovation because this relationship was not statistically significant. Prospector firms might for instance, employ balanced scorecards, project milestones, product portfolio roadmaps, product concept testing processes, or different guidelines (see Bisbe and Malagueño 2009; Davila et al. 2009). Furthermore, budget preparation frequency had a negative, significant relationship with non-financial performance in prospector firms.

Overall, the study shows that budget preparation frequency and interactive budgeting are not important for prospector firms engaged in new product innovation or improving performance. To summarize, this study contributes to the existing innovation and budgeting literature by showing that budget preparation and interactive budgeting affect product innovation and performance differently in defender and prospector firms. We also contribute to earlier contingency theory-based studies (e.g. Chenhall, 2003) by showing that neither perceived environmental uncertainty nor firm size affected the results.

6. Contribution and limitations

To summarize our findings and contribution, budget preparation frequency affects firm performance through the interactive use of budgets and product innovation. This finding contributes to earlier interactive budgeting, product innovation, and performance studies in a number of ways (e.g., Bisbe and Otley 2004; Bisbe and Malagueño 2009; Dunk 2011). First, the study illustrates the role of budget preparation frequency on product innovation and performance. It shows that budgets and their interactive use are important for product innovation. Second, the findings show that the effect of the interactive use of budgets on performance is mediated by product innovation (e.g., Lau *et al*. 1997). However, bootstrapping results indicated that this mediation is not strong although it is statistically significant.

Third, the interactive use of budgeting was positively associated with product innovation. Accordingly, budgeting appears to be an important factor in driving product innovation, contributing to the findings of Bisbe and Otley (2004). Fourth, the results contribute to the existing budgeting, innovation, and performance literature (e.g., Bisbe and Otley 2004; Dunk 2011) by separating the concepts of budget preparation frequency and interactive budgeting and financial and non-financial performance. Finally, a contribution is made to contingency theory because the strategy type is found to be affected by the results in the context of budgeting and product innovations.

We also tested the robustness of the paths using subsamples split according to perceived environmental uncertainty, size, and strategy, which contingency theory has proposed as variables affecting the use of MCS (Chenhall 2003). These tests showed that PEU and size do not affect the main conclusions. However, for low prospectorship or strong defender strategies, the effects of frequency of budget preparation on interactive budgeting and the effect of product innovation on

non-financial performance are insignificant. In these firms, interactive budgeting positively affects product innovation. The finding of the positive effect of interactive budgeting on product innovation, however, comes from the strong effect found in defender firms. The negative impact of budget preparation frequency on non-financial performance is found only in prospectors. At the level of the entire sample, this effect is not identifiable.

Despite the findings, this study has limitations that must be addressed. First, the survey data report the perceptions of respondents, and it is possible that they do not represent actual practices in their firms. Second, the linkages between the variables do not necessarily indicate causality between the variables. Thus, performance can have an effect on product innovation and budgeting, which is the opposite direction determined by our PLS analysis. Third, non-response bias may have affected our results, although we followed suggestions for gathering data and comparing responses from early and late respondents proposed in previous studies. Fourth, we focused only on interactive use (see Simons 1990; 1994) of budgets for the reasons presented in the introduction. Finally, several factors other than budgeting (such as other contingency variables as examined in this study) may also have an effect on product innovation.

Despite these limitations, we believe that our study contributes to the product innovation literature as it investigates the role of budgeting in product innovation. Despite criticism of the method, budgeting is still an extensively-used MCS for a variety of purposes in different organizations.

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Appendices

Appendix 1. Description of the constructs.

Panel A. Operative budgeting frequency of preparation.

Which of the following budgets are prepared in your firm and how often? (7-point scale: 1 = not used … 4 = used at times … 7 = systematically)

OPER1. Operative budget, yearly.
OPER2. Operative budget, half-yearly.
OPER3. Operative budget, quarterly.
OPER4. Operative budget, monthly.
OPER5. Operative budget, weekly.

Panel B. Interactive budgeting.

To what extent do you agree or disagree with the following statements? (On a 7-point scale: 1 = totally disagree … 7 = totally agree)

INTER1. The budget process is continuous and demands regular and frequent attention from managers at all levels.
INTER2. There is a lot of interaction between top management and department/unit managers in the budget process.
INTER3. Managers use the budget process to discuss changes occurring in the firm with peers and subordinates.
INTER4. Managers use budgeting information as a means of questioning and debating the ongoing decisions and actions of lower-level managers.
INTER5. Budget tracking reports also play a central role in management discussions when there are no deviations from plans.

Panel C. Product innovation.

To what is the extent do the following statements describe your company? (On a 7-point scale: 1 = not at all … 7 = very well)

INNO1. During the last three years, we have launched more new products in the market than the industry average.
INNO2. Our firm is more often first-in-market with new products compared with the industry average.
INNO3. The percentage of new products launched in the product portfolio is much higher than the industry average.
INNO4. Our firm has probably more new products at the developmental phase to be launched next year than the industry average.

Panel D. Performance.

In comparison with the industry average, how would you qualify the performance of your company over the last three years in terms of the following indicators? (On 7-point scale: 1 = well below the average … 4 = about average … 7 = well above the average)

PERF1. Rate of sales growth.
PERF2. Rate of profit growth.
PERF3. Return on investment.
PERF4. Profit/sales ratio.
PERF5. Increase in market share.
PERF6. Customer satisfaction.
PERF7. Customer retention.
PERF8. Acquisition of new customers.

Panel E. Perceived environmental uncertainty.
What is your perception of the relative predictability of the following eight items of the firm's environment? (On 7-point scale: 1 = very predictable… 7 = very unpredictable)

PEU1. Suppliers' actions
PEU2. Customer demands, tastes and preferences
PEU3. Deregulation and globalization
PEU4. Market activities of competitors
PEU5. Production and information technologies
PEU6. Government regulation and policies
PEU7. Economic environment
PEU8. Industrial relations

Panel F. Strategy.

How the following descriptions most closely fit the strategy of your firm compared to other firms in the industry (on 7-point scale: 1 = defender, 4 = analyzer, 7 = prospector).

Defender (=1): This type of organization attempts to locate and maintain a secure niche in a relatively stable product or service area. The organization tends to offer a more limited range of products or services than its competitors, and it tries to protect its domain by offering higher quality, superior service, lower prices, and so forth. Often this type of organization is not at the forefront of developments in the industry—it tends to ignore industry changes that have no direct influence on current areas of operation and concentrates instead on doing the best job possible in a limited area.
Analyzer (=4): This type of organization attempts to maintain a stable, limited line of products or services, while at the same time moving out quickly to follow a carefully selected set of the more promising new developments in the industry. The organization is seldom "first in" with new products or services. However, by carefully monitoring the actions of major competitors in areas compatible with its stable product-market base, the organization can frequently be "second in" with a more cost-efficient product or service.
Prospector (=7): This type of organization typically operates within a broad product-market domain that undergoes periodic redefinition. The organization values being "first in" in new

product and market areas even if not all of these efforts prove to be highly profitable. The organization responds rapidly to early signals concerning areas of opportunity, and these responses often lead to a new round of competitive actions. However, this type of organization may not maintain market strength in all of the areas it enters.