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Effects of using static and flexible budgets on process and product innovation

Efeitos do uso dos orçamentos estático e flexível na inovação de processos e produtos

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Keywords
Static budget.
Flexible budget.
Process innovation.
Product innovation.

Abstract

This study analyzes the effects of using static and flexible budgets on process and product innovation. A survey was conducted with managers of companies benefited by the Brazilian Law No. 11,196 of November 21, 2005, known as Lei do Bem (Law of Good), obtaining 133 valid answers. Partial least squares structural equation modeling was applied to test the hypotheses. Additionally, an importance-performance maps analysis was used. The results indicate a positive and significant relationship between both static and flexible budgets with process innovation and product innovation. Static budget exhibits greater importance toward process innovation, while flexible budget exhibits greater importance toward product innovation. Overall, the findings reinforce the complementarity of static and flexible budgets in relation to technological innovation. These results contribute to the literature on Management Control Systems, specifically on the usefulness of the budgets, in addition to practical contributions to management, as in the case of innovative companies benefited by the Law of Good.

Palavras-chave
Orçamento estático.
Orçamento flexível.
Inovação de processos.
Inovação de produtos.

Resumo

Este estudo analisa os efeitos do uso dos orçamentos estático e flexível na inovação de processos e produtos. Uma survey foi realizada com gestores de empresas beneficiadas pela Lei n° 11.196, de 21 de novembro de 2005, denominada de Lei do Bem, e obteve-se 133 respostas válidas. Para testar as hipóteses aplicou-se a modelagem de equações estruturais, por mínimos quadrados parciais. Adicionalmente, fez-se a análise de mapas de importância-desempenho. Os resultados indicam relação positiva e significativa tanto do orçamento estático como do orçamento flexível com inovação de processos e inovação de produtos. O orçamento estático apresenta maior importância em prol da inovação de processos, enquanto o orçamento flexível exibe maior importância na inovação de produtos. De maneira geral, os achados reforçam a complementaridade dos orçamentos estático e flexível em relação à inovação tecnológica. Esses resultados contribuem para a literatura de Sistemas de Controle Gerencial, em específico sobre a utilidade dos orçamentos, além de contribuições práticas para a gestão, como no caso das empresas inovadoras beneficiadas pela Lei do Bem.

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Practical implications

The use of static and flexible budgets positively influences process and product innovation. However, static budget should be prioritized on process innovation, while flexible budget on product innovation. Thus, managers can assign more attention to the budget according to the strategic priorities.

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1 INTRODUCTION

Innovation is pointed out as one of the primary resources for the organization to achieve competitive advantage (Chenhall & Moers, 2015), make changes in the market (Henri, 2006) and ensure its survival (Burns & Stalker, 1961). Schumpeter (1982) indicated that economic development is driven by innovation, in which new technologies are created and recreated to replace old ones. The Organization for Economic Cooperation and Development (OECD, 2005) states that technological innovation is understood as the implementation of something new or improved in the organization, which may include process and/or product innovations.

Innovation imposes challenges on management (Bedford, Bisbe & Sweeney, 2019) that can be managed with supporting organizational mechanisms (Tidd & Bessant, 2015), such as the budget (Ehkolm & Wallin, 2011). Budget is considered one of the most important control and planning mechanisms used by companies (Horngren, Foster & Datar, 2000). Long ago, it was seen as unable to be functional in high uncertainty environments (Hope & Fraser, 2003), especially traditional annual budgets, which should then be replaced by continuous and flexible budgets (Hansen, Otley & Van der Stede, 2003). However, some indicate that annual budgets are still useful (Libby & Lindsay, 2007; Dugdale & Lyne, 2008), and complementary to flexible budgets (Ekholm & Wallin, 2000, 2011). Contrasting positions regarding the usefulness of the budget are observed, which points to gaps and research opportunities (Sponem & Lambert, 2016; Henri, Massicotte & Arbour, 2019).

Despite the adoption of more flexible budgets by organizations, the static budget does not appear to be totally dispensable (Matějka, Merchant & O'Grady, 2020), which suggests complementarity of Management Control Systems (MCS) in innovation environments (Grabner & Moers, 2013; Bedford, Malmi, & Sandelin, 2016), and specifically of the usefulness of static and flexible budgets (Ekholm & Wallin, 2000). Previous studies have already provided evidence of the traditional (static) annual budget being an antecedent of process (Dunk, 2011) and product innovation (Lopez-Valeiras, Gonzalez-Sanchez & Gomez-Conde, 2016). Evidence also indicates influence of the flexible budget on process (Bisbe & Otley, 2004; Lopez-Valeiras et al., 2016; Pazetto, Mannes, & Beuren, 2020) and product innovation (Dunk, 2011; Laitinen, Länsiluoto, & Salonen 2016).

Positive influence of static and flexible budgets on process and product innovation is assumed in the present study. Budget is a MCS, which can vary from one company to another. However, it needs to be aligned with the overall management (Sponem & Lambert, 2016). According to Ekholm and Wallin (2011), this implies understanding the usefulness of the static and flexible budget. Thus, there is the following research question: Does the use of static and flexible budgets have influence on product and process innovation? Therefore, the objective of the herein study is to analyze the effects of the use of static and flexible budgets on product and process innovation in companies benefited by the Brazilian Law No. 11,196 of November 21, 2005. This law, known as Lei do Bem (Law of Good), offers tax subsidies for private organizations to intensify their investments in Research, Development and Innovation (RD&I).

The relevance of investigating these relationships is limited to offering new insights into the interaction of budgets with innovation, which is still controversial in the literature (Ekholm & Wallin, 2000; Hope & Fraser, 2003; Libby & Lindsay, 2007). Dunk (2011) stresses the importance of looking at how budget is used in innovation environments. It is also justified by the importance of budget as one of the MCS that enables improvements in organizational outcomes (Dal Magro & Lavarda, 2015). Thus, the study contributes by investigating to what extent static and flexible budgets (MCS) can be used in a complementary way by managers in order to facilitate innovation (Grabner & Moers, 2013; Bedford et al., 2016).

Camisón and Villar-Lopez (2014) pointed out that there is a need to segregate technological innovation into process and product innovation to elucidate the particularities and similarities. With this, the effects of static and flexible budgets on process and product innovation are clarified, considering the perspective of possible complementarity of budgets. Thus, it contributes to the management of innovative companies by pointing out which type of budget contributes to dealing with uncertain environments and from the perspective of process and product innovation. The companies that are focus of the analysis are driven by innovation and receive tax exemptions to intensify investments in RD&I, which elucidates the importance of understanding the use of MCSs to promote innovation.

2 LITERATURE REVIEW AND HYPOTHESES

2.1 Perceived usefulness of budget and technological innovation

A OCDE (2005) expõe que a inovação tecnológica consiste nas inovações de processos e de produtos, que repreAccording to the OECD (2005), technological innovation consists of process and product innovations, which represent the main types of innovation. Process innovation consists of the realization of new processes, or of processes with considerable changes, which leads to cost reduction and improves the condition of the production or distribution of the products (Gunday, Ulusoy, Kilic & Alpkan, 2011). Product innovation, on the other hand, comprises considerable changes in technical, functional, component, or material specifications (Gunday et al., 2011).

Innovation is one of the main aspects that ensures the maintenance and continuity of companies' businesses (Burns & Stalker, 1961), by permeating (re)adaptations in processes and products (OECD, 2005). However, managing and stimulating innovation in organizations is a challenge imposed on managers (Bedford et al., 2019), which requires organizational strategic attention (Tidd & Bessant, 2015) and (re)alignments of the MCSs employed in the management (Chenhall & Moers, 2015). From this perspective, the corporate budget can embody various functions and assume multiple roles in organizations (Mucci, Frezatti & Dieng, 2016; Sponem & Lambert, 2016; Henri et al., 2019).

Strands of literature point to the budget as an enabling mechanism that managers can use to promote innovation and innovative solutions broadly, in the face of external turbulence (Frow, Marginson & Ogden, 2010). Along these lines, evidence points out that the interactive use of the MCS, in this case the budget, has the potential to drive process and organizational innovation (Lopez-Valeiras et al., 2016), just as budgeting from a planning perspective (control) can facilitate (hinder) product innovation (Dunk, 2011). At its core, budgeting involves setting goals, plans, and a constant comparative analysis of what was planned with the actual results of the organization (Ekholm & Wallin, 2011).

The literature classifies budgets into two main types, static budget and flexible budget, once known as fixed and variable (Horngren et al., 2000). The static budget is usually prepared once a year based on sales volume, having a reference point, with no changes allowed from its setting, in that year (Ekholm & Wallin, 2011). This type of budget is traditionally considered the basis of managerial control in organizations (Otley, 1999; Cassar & Gibson, 2010) and has been used in many different organizations. In turn, the flexible budget does not determine variable expenses and sales volume and can be changed at shorter intervals compared to the static one (Ekholm & Wallin, 2011).

2.2 Hypothesis developments

Budgets favor innovative attitudes by indicating where spending for innovation can be increased, and where spending in less innovative areas should be limited (Ehkolm & Wallin, 2011). Studies, such as by Horngren et al. (2000), indicate that the annual budget assists in environmental uncertainty by serving as a buffer and allowing for systematic reactions. However, Dunk (2011) points out that depending on the purpose of the budget (planning or control), the impacts on innovation differ. Static budgeting has been pointed out in the literature as unable to deal with high uncertainty environments (Hope & Fraser, 2003). It is argued that static budget is appropriate for environments that do not have high uncertainty, while flexible budget is better suited for environments with high uncertainty (Samuelson, 1986).

It is noted that there are arguments in the literature supporting that the fixed annual budget can provide support for environmental uncertainty (Ekholm & Wallin, 2000), but there are also notes proposing that they are not perceived as appropriate for uncertain environments (Hope & Fraser, 2003; Ekholm & Wallin, 2011). Although some organizations seek support in types of budgets that are not so rigid, it seems that the usefulness of the annual budget still figures an indispensable way to subsidize the decision-making process (Matějka et al., 2020).

In the stream that considers the fixed annual budget as complementary to the flexible one, there is the study by Ekholm and Wallin (2000), which investigated the validity of the criticisms perceived by executives of Finnish companies. It was observed that few companies intend to abandon the annual budget, supposedly with the role of maintaining internal efficiency, and that most of them pointed to alternative systems, such as continuous forecasting, as complementary to the annual budget. It is pointed out that in counterpoint to the use of isolated managerial controls, certain MCSs present complementarity in the context of encouraging innovation (Grabner & Moers, 2013; Bedford et al., 2016). Thus, the static budget can be perceived as complementary to the flexible budget (Ekholm & Wallin, 2000). Thus, the following hypotheses are proposed:

H_1: The use of static budget is positively and significantly associated with process innovation.

H_2: The use of static budget is positively and significantly associated with product innovation.

Budget use can exert effect on innovation, particularly when the budget permeates the interactive use (Laitinen et al., 2016) or planning (Dunk, 2011) perspective. Evidence suggests that the interactive use of the MCS, which encompasses the budget perspective, is positively associated with process innovation (Lopez-Valeiras et al., 2016). Broadly speaking, more flexible MCSs instigate and can drive innovation in organizations (Saunila & Mäkimattila, 2018). Thus, the use of budget in technological innovation (processes and products) seems to have positive association.

Given the unpredictability of innovation, MCSs with greater flexibility may be beneficial to promote (re)adaptation of organizational behaviors (Davila et al., 2009). In entrepreneurial environments, flexible and interactive MCSs support innovation (Chtioui & Dubuisson, 2020), in exploration and exploitation perspectives (Bedford, 2015). Flexible and interactive MCSs are more suitable in scenarios of uncertainty (Ahrens & Chapman, 2004), which can reflect on innovation, such as process innovation. Bisbe and Otley (2004) observed that interactive control strengthens (through moderation) the relationship of (product) innovation towards performance, and that further research may contemplate the process innovation perspective. Similarly, Pazetto et al. (2020) found that the interactive use of MCS is positively associated with process innovation.

Basically, flexible budgets are seen as favorable for environments with high uncertainty (Samuelson, 1986). According to Khandwalla (1972), MCSs, especially flexible budgets, have positive association with growth induced by product competition. Van der Stede (2000) found in his study that less rigid budget controls are strongly used and preferred by business units that propitiate the differentiation strategy, as they have better support for flexibility and environmental changes. Laitinen et al. (2016) showed that the use of interactive budget (more flexibility-oriented) has a positive association with product innovation. Thus, the following hypotheses are formulated:

H_3: The use of flexible budget is positively and significantly associated with process innovation.

H_4: The use of flexible budget is positively and significantly associated with product innovation.

Through the literature review and the construction of the hypotheses, the conceptual model of the research is presented (Figure 1).

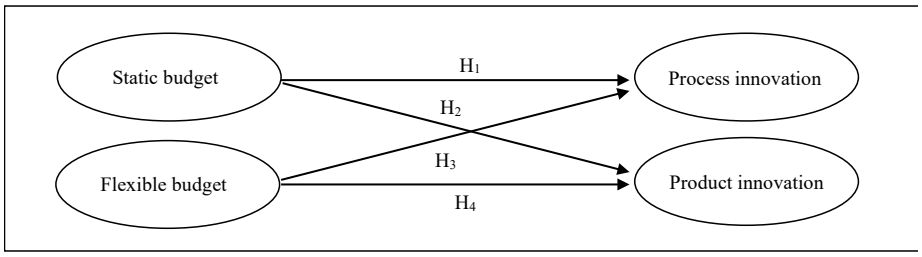

Figure 1. Conceptual model
Source: prepared by the authors.

3 METHODOLOGICAL PROCEDURES

3.1 Population and sample

A survey was conducted with managers of companies benefited by the Brazilian Law No. 11,196, of November 21, 2005. This law seeks to contribute with private companies focused on innovation, offering fiscal subsidies to intensify their investments in RD&I. As these companies go through a selection process to receive the benefit, it is assumed that they invest intensively in technological innovation activities, thus composing the population of this study.

Mapping the companies on the website of the Ministry of Science, Technology, Innovation and Communications resulted in a list of 957 companies benefited in the most recent round of tax incentives. Thus, these companies and their managers were searched for in the professional network LinkedIn. It was opted for more strategic positions and up to five invitations per company. This search identified 1,526 professionals, to whom the invitation to establish a connection and the link to the questionnaire on the QuestionPro platform were sent. Although the research did not go through an Ethics Committee, ethical procedures commonly adopted in similar research were followed, such as guaranteed anonymity and the use of aggregate responses, without identifying the respondent. Data collection occurred from September 2019 to February 2020, resulting in 133 valid responses.

The profile of the respondents indicates that a large portion are male (91%), have postgraduate degree (89%), are managers or hold leading positions at other hierarchical levels (48%). Most of the respondents' companies operate nationally and internationally (65%), and 43% have been in business for more than 50 years. As for the sectors in which they operate, mechanical and transportation (24%) and information technology (25%) stand out. The number of employees ranges from 500 to 5,000 (42%). The profile of the respondents indicates that they meet the conditions to answer the research instrument.

3.2 Research instrument

To measure the constructs related to budgets, 11 items were adapted from Ekholm and Wallin (2011) for the static budget and 11 items for the flexible budget. In turn, to measure the constructs of technological innovation, 5 items were adapted from Gunday et al. (2011) for process innovation and 5 items for product innovation. A five-point Likert scale was used to measure the indicators, but with different weightings (see Appendix A). To minimize common method bias (CMB), the respondent's anonymity was guaranteed, in addition to the concise and explanatory arrangement of the items (Podsakoff, MacKenzie, Lee & Podsakoff, 2003).

3.3 Data analysis technique

Data analysis was conducted using partial least squares structural equation modeling (PLS-SEM) in SmartPLS 3.0 software. PLS-SEM has been receiving increasing attention in the business field, as it is robust in the face of lack of multivariate normality and feasible for relatively small samples (Hair Jr., Risher, Sarstedt & Ringle, 2019). Additionally, the importance-performance map analysis (IPMA) was conducted for each endogenous variable and its respective predictors. The IPMA allows highlighting the interface between importance (beta coefficients) and performance (mean value of the constructs), enriching the PLS-SEM results (Ringle & Sarstedt, 2016).

The minimum sample size for PLS-SEM was determined by G*Power 3.1 software. From an average effect size (f2) (15%), α err. prob. of 5%, minimum power (1-β err. prob.) of 80%, and two predictors for the dependent variable with the highest number of arrows received, a minimum of 68 responses are needed. Therefore, the sample size of 133 responses is appropriate. To assess the possible existence of the CMB, Harman's single factor test evidenced that one factor (34.19%) does not account for half of the total variance explained, indicating it is not a problem (Podsakoff et al., 2003).

4 ANALYSES OF THE RESULTS

4.1 Measurement model

First, the measurement model (Table 1) of the PLS-SEM (Hair Jr., Hult, Ringle & Sarstedt, 2017) was evaluated. One item of the flexible budget construct was excluded for the adjustment of the model since it did not fit in the confirmatory factor analysis. This flexible budget item consists of "determining operating volumes," and its low factorial load (<0.70) indicated some misalignment with the other items of the construct for the present sample (Hair Jr. et al., 2017). After its exclusion, the remaining indicators have adequate factorial load (≥0.70) in their respective construct (Hair Jr. et al., 2017).

Table 1. Measurement model

Construct	Mean	Standard deviation	α	ρA	CR	AVE	Fornell-Larcker\ HTMT			
							1	2	3	4
1.Process innovation	3.83	1.07	0.851	0.872	0.892	0.623	**0.790**	0.707	0.340	0.266
2.Product innovation	3.80	1.15	0.839	0.848	0.885	0.607	0.606	**0.779**	0.277	0.276
3.Static Budget	4.02	0.99	0.948	0.957	0.955	0.659	0.325	0.261	**0.812**	0.386
4.Flexible budget	4.11	1.03	0.944	0.968	0.952	0.663	0.258	0.270	0.364	**0.814**

Source: elaborated by the authors.

Note: Values in bold represent the square root of the AVE and the left/ bottom diagonal shows the correlation values, while the top/ right diagonal shows the HTMT values.

Internal consistency reliability is confirmed by Cronbach's Alpha (α), rho_A (ρA) and Composite reliability (CR), with values above 0.70 (Hair Jr. et al., 2019). Convergent validity was attested by AVE values greater than or equal to 0.50 (Hair Jr. et al., 2019). Discriminant validity was observed by two parameters: the Fornell-Larcker criterion, in which the square root values of the AVE are greater than the coefficients of the correlations (Hair Jr. et al., 2017); and the Heterotrait-Monotrait Ratio of Correlations (HTMT) criterion, with values less than 0.85 (Hair Jr. et al., 2019). Therefore, the measurement model is adequate.

4. 2 Structural model

The evaluation of the structural model begins by arranging the path analysis (Table 2), with the stipulated relationship, beta coefficient (β), p-value and the decision for the hypothesis.

Table 2. Path analysis

H	Relationship	Beta (β)	Decision
H_1	Static Budget→Process innovation	0.266**	Accepted
H_2	Static Budget→Product innovation	0.188*	Accepted
H_3	Flexible budget→Process innovation	0.161*	Accepted
H_4	Flexible budget→Product innovation	0.201*	Accepted

Source: elaborated by the authors.

Note: *p<0.10; **p<0.01; bootstrap with 5,000 subsamples.

The possible presence of multicollinearity in the model was evaluated using the Variance inflation factor (VIF). The highest value found (1.153) indicates no multicollinearity (<3) (Hair Jr. et al., 2019). The explained variance of the endogenous variables was observed, by means of the coefficient of determination (R2). Consistent with Cohen (1988), R2 can be small (2%), medium (13%) or large (26%) and, thus, process innovation has medium (12.8%) explanatory power and product innovation has small to medium (10.4%). The predictive relevance of the endogenous variables was determined by the Stone-Geisser indicator (Q2), obtaining values above zero for process innovation (6.2%) and product innovation (4.9%) (Hair Jr. et al., 2019).

4.3 Importance-Performance analysis

The assumptions for applying the IPMA are fully met: rescaling the mean values of the constructs to the range from 0 to 100; all codings have the same scalar direction, i.e., higher values represent better performance on all constructs; and all estimates of external weights are positive (Ringle & Sarstedt, 2016). Figure 2 shows the IPMA for process innovation.

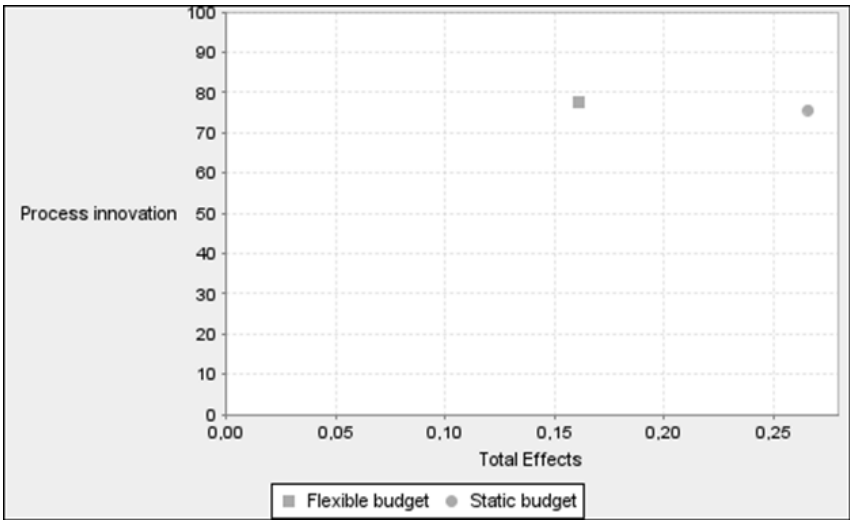

Figure 2. Process Innovation IPMA
Source: elaborated by the authors.

The IPMA basically considers importance (total effects, on the x-axis) and performance (average score of the constructs, on the y-axis). Although static budget (75.608) and flexible budget (77.747) show similar performances, static budget (β=0.266) has higher importance (total effects) than flexible budget (β=0.161) in process innovation. Figure 3 shows the IPMA analysis for product innovation.

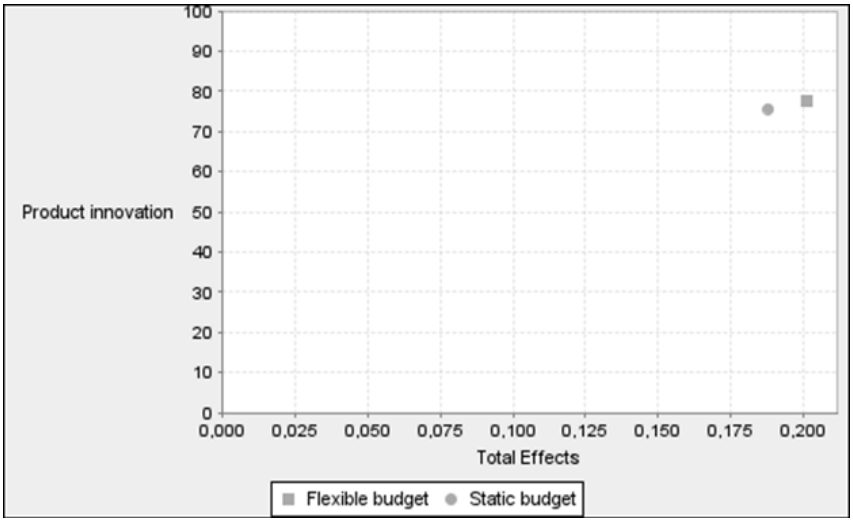

Figure 3. Product Innovation IPMA
Source: elaborated by the authors.

Figure 3 demonstrates static budget (performance: 75.608, importance: β=0.188) and flexible budget (performance: 77.747, importance: β=0.201) in fostering product innovation. Static budget has greater importance in process innovation, while flexible budget presents greater importance in product innovation. As for performance, there is little difference, with slightly higher trend for flexible budget compared to static budget, in both technological innovations.

4.4 Discussion of the results

Hypothesis H_1 stipulates that the use of static budget is positively and significantly associated with process innovation. This hypothesis was supported statistically (β=0.266, $p<0.01$) and denotes its importance (β=0.266) and performance (75.608) in the efforts employed to process innovation. This finding corroborates Lopez-Valeiras et al. (2016), that the interactive use of the MCS, which contemplates the budget, has the ability to influence process innovation. Thus, the innovation of methods and skills that assist in the execution of new or improved goods/services (OECD, 2005) has as antecedent the use of the static budget, present among the traditional managerial controls of the organization (Otley, 1999; Cassar & Gibson, 2010).

Hypothesis H_2 proposes that the use of static budget is positively and significantly associated with product innovation, and is statistically accepted (β=0.188, p<0.10). Static budget receives considerable importance (β=0.188) and performance (75.608). This evidence matches the literature, that when static budget is used in the planning framework, it is positively associated with product innovation (Dunk, 2011). It is perceived that the usefulness of static budget is aligned with the development, improvement or creation of the attributes of goods/services (OECD, 2005).

Hypotheses H_1 and H_2 indicate that the use of static budgeting has a positive and significant influence on technological innovation (processes and products). This finding is relevant, because although several organizations show interest in more flexible budgets several show resistance to abandon the traditional budget (Ekholm & Wallin, 2000; Matějka et al., 2020). Static budgeting seems to be able to provide backing for the organization in supporting environmental uncertainty (Ekholm & Wallin, 2000), which may support its use in organizations (Dal Magro & Lavarda, 2015). Also, static budgeting may have positive effects on innovation (Horngren et al., 2000; Ekholm & Wallin, 2000).

Hypothesis H_3 indicates that the use of flexible budget is positively and significantly associated with process innovation. The hypothesis was accepted statistically (β=0.161, p<0.10) and reveals its importance (β=0.161) and performance (77.747). Thus, the studies of Pazetto et al. (2020), which evidenced a relationship between interactive MCS use and process innovation, and Lopez-Valeiras et al. (2016), which contemplated the budget from the interactive MCS perspective and found a positive association with process innovation, are corroborated. This finding indicates that greater MCS flexibility, in this case budget, promotes constant organizational re-adaptations, favorable to the companies (Davila et al., 2009), especially entrepreneurial organizations that focus on innovation (Chtioui & Dubuisson, 2020).

Hypothesis H_4 assumes that the use of flexible budgeting is positively and significantly associated with product innovation, and is statistically supported (β=0.201, p<0.10), and presents its importance (β=0.201) and performance (77.747). This finding is consistent with the literature (Van der Stede, 2000; Dunk, 2011; Laitinen et al., 2016) that points to flexible budgeting as aligned with sustaining product innovation, for having less rigid and adjustable characteristics, being prioritized by organizations in high uncertainty environments, characteristic of innovative environments, focused on product innovation.

By means of hypotheses H_3 and H_4, it is inferred that the use of flexible budget positively influences technological innovation, both of processes and products. Thus, it was possible to prove what has been highlighted in previous research (Van der Stede, 2000; Dunk, 2011; Laitinen et al., 2016), that a budget with less rigid and more malleable characteristics has a positive influence on innovation, especially technological innovation. Furthermore, from the perspective of environmental uncertainties, the findings reinforce that the use of interactive and flexible MCSs are beneficial to promote innovation (Khandwalla, 1972; Samuelson, 1986).

As for the importance-performance analysis, both budgets (static and flexible) show similar performance with respect to technological innovation (processes and products). However, some peculiarities are observed, such as the fact that static budget receives higher priority (importance) in process innovation, while flexible budget receives higher priority in product innovation. This finding of priority comes basically from the IPMA, which allows the analysis of importance via total effects. Consequently, the finding suggests that annual (traditional) budgeting has greater alignment (association) with process innovation, i.e., methods, skills, and procedures for the development or improvement of goods/services (OECD, 2005; Gunday et al., 2011). In contrast, flexible budget shows greater effect on product innovation, i.e., on technical and functional specifications, components or materials (Gunday et al., 2011), which result in goods/services with new or improved attributes (OECD, 2005).

5 FINAL CONSIDERATIONS

This study analyzed the effects of the use of static and flexible budgets on process and product innovations in companies benefiting from the Brazilian Law of Good, which relied on exemptions for the promotion of technological innovation. By estimating the implications of the use of static and flexible budgets, the evidence supports a positive relationship with process and product innovation, and the research hypotheses can be accepted. It is concluded that the use of budgets is aligned with process and product innovations in the companies of the sample. The complementarity of both budgets in technological innovation is highlighted, given the positive effects between the proposed relationships. Moreover, the static budget denotes greater importance in process innovation, while the flexible budget presents greater importance in product innovation.

5.1 Theoretical implications

By heeding Camisón and Villar-Lopez's (2014) call regarding the segregation of technological innovation into products and processes, differences are perceived regarding the importance of each budget for each of the innovations, thus advancing the literature. The findings also match the fact that organizations, despite being in search of more flexible budgets, mostly do not abandon the traditional budget (Matějka et al., 2020). This may stem from the perceived complementarity of the use of static and flexible budgets (Ekholm & Wallin, 2000), supported by the findings of the present study. The positive association of the use of budgets (static and flexible) at the expense of technological innovation also implies in highlighting the complementarity of both budgets in innovation contexts, which had been previously evidenced with other MCSs (Grabner & Moers, 2013; Bedford et al., 2016). Finally, it contributes to the discussion of organizational mechanisms to support innovation management (Tidd & Bessant, 2015).

5.2 Managerial implications

It is important for the managers of these companies to align the static and flexible budgets in order to complement each other when the intention is to innovate more in processes or products, and also that they understand that the use of the budget, traditional (static) and / or flexible, positively influences processes and products innovation, since this is a capability with a certain degree of difficulty to be managed. Moreover, as companies that receive subsidies to promote technological innovation (Law of Good), it is relevant to understand how the MCS, specifically the budget, could provide and boost innovation. Thus, managers can use the budget in defining goals, plans, and planning to stimulate processes and products innovation.

Although both budgets constitute similar performance in the face of technological innovation, some peculiarities represent practical implications for managers, due to the importance assumed by the budgets for each innovation. It is possible to notice that static budget should receive higher priority in the context of process innovation, whereas flexible budget in the context of product innovation. Thus, in the face of organizational goals and preferences about the type of technological innovation (need or purpose of greater emphasis on processes or products), managers can assign greater attention to the budget according to priorities, in order to better align the use of the budget with the respective technological innovation.

5.3 Limitations and suggestions

The limitations of the present research may represent new research opportunities. First, the data should be generalized cautiously since the sample comprises exclusively companies benefited by the Brazilian Law of Good, which indicates the need for new studies with other samples, for possible comparisons. Second, as innovation enabling MCS, only static and flexible budget were considered. Therefore, future studies may contemplate other types of MCS. Third, the study considered the symmetric relationship of budget (static and flexible) in technological innovation, but further research can explore the interdependence and complementarity of the MCSs, through asymmetric analysis, such as fuzzy-set qualitative comparative analysis. Also, no control variables were used, which may be considered in future research.

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APPENDIX A - Research instrument

Budget usefulness # Adapted from Ekholm and Wallin (2011)	**Loading**
Static budget	
Indicate how useful you find the fixed annual budget for the following purposes in your organization. Scale: 1=not at all useful; 5=very useful.	
1. Planning linked to the company's strategies.	0.808
2. Co-ordination of the company's units.	0.873
3. Allocation of resources to the units.	0.857
4. Determination of operational volumes.	0.785
5. Allocation of responsibility.	0.786
6. Follow-up to facilitate rapid corrections.	0.799
7. Communication of goals and ideas.	0.851
8. Creating awareness of what is important to achieve.	0.820
9. Operationalisation of objectives.	0.835
10. Staff motivation.	0.705
11. Functioning as a basis for compensation and bonus systems.	0.800
Flexible budget	
Indicate how useful you find the flexible budgets (variable, flexible, revised, or rolling) for the following purposes in your organization. Scale: 1=not at all useful; 5=very useful.	
12. Planning linked to the company's strategies.	0.771
13. Co-ordination of the company's units.	0.817
14. Allocation of resources to the units.	0.814
15. Determination of operational volumes.	a
16. Allocation of responsibility.	0.794
17. Follow-up to facilitate rapid corrections.	0.812
18. Communication of goals and ideas.	0.881
19. Creating awareness of what is important to achieve.	0.871
20. Operationalisation of objectives.	0.846
21. Staff motivation.	0.812
22. Functioning as a basis for compensation and bonus systems.	0.711
Technological innovation	
# Adapted from Gunday et al. (2011)	
Process innovation	
Indicate the extent of process innovations implemented in your organization over the past three years. Scale: 1=not implemented; 2=imitated from national markets; 3=imitated from international markets; 4=current processes were improved; 5=original process innovations were implemented.	
23. Determining and eliminating non-value adding activities in production processes.	0.790
24. Decreasing variable cost components in manufacturing processes, techniques, machinery and software.	0.772
25. Increasing output quality in manufacturing processes, techniques, machinery and software.	0.807
26. Determining and eliminating non-value adding activities in delivery related processes.	0.839
27. Decreasing variable cost and/or increasing delivery speed in delivery related logistics processes.	0.736
Product innovation	
Indicate the extent of product innovations implemented in your organization over the past three years. Scale: 1=not implemented; 2=imitated from national markets; 3=imitated from international markets; 4=current product were improved; 5=original product innovations were implemented.	
28. Increasing manufacturing quality in components and materials of current products.	0.764
29. Decreasing manufacturing cost in components and materials of current products.	0.781
30. Developing newness for current products leading to improved ease of use for customers and to improved customer satisfaction.	0.829
31. Developing new products with technical specifications and functionalities totally differing from the current ones.	0.795
32. Developing new products with components and materials totally differing from the current ones.	0.724

Source: elaborated by the author.
Note: a = excluded for model fit.