Assessing the impact of budgetary participation on budgetary outcomes: the role of information technology for enhanced communication and activity-based costing

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Abstract This paper addresses the long-standing question of how budgetary participation (BP) affects budgetary outcomes. Information technology for enhanced communication (ITEC) and activity-based costing (ABC) are taken into consideration as moderators that might affect the relationship between BP and budgetary outcomes in manufacturing firms. Based on moderated and polynomial regression analyses, the study's findings indicate that the main effects of BP, ITEC and ABC on budgetary outcomes are not significant, and that while ABC significantly moderates the relationship between budgetary participation and budgetary slack, ITEC does not moderate this relationship. Results also indicate that both ITEC and ABC significantly moderate the relationship between budgetary participation and managerial performance. These findings suggest that the effect of budgetary participation on budgetary outcomes can be contingent on ITEC and ABC although their impact varies with the nature of budgetary outcomes.

Keywords Activity-based costing · Budgetary participation · Information technology · Moderation effects · Managerial performance · Slack

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1 Introduction

Organizations allow employees to participate in the budget-setting process expecting to reduce budgetary slack or improve performance (Douglas and Wier 2000; Covaleski et al. 2003; Marginson and Ogden 2005; Sheely and Brown 2007; Derfuss 2009). However, the results of prior studies examining the relationship between budgetary participation and managerial performance are inconsistent. For example, some studies outline a significant positive relationship between budget participation and managerial performance (Subramaniam and Ashkanasy 2001; Chong and Chong 2002; Lau and Lim 2002; Chong and Leung 2003; Moll 2003; Latham 2004; Indjejikian and Matejka 2006; Parker and Kyj 2006; Nouri and Kyj 2008; Wong-On-Wing 2010). Interestingly, other studies (Otley and Pollanen 2000; Locke and Latham 2002) suggest budgetary participation has no performance effect, while the findings of Gul et al. (1995) suggest that budgetary participation actually reduces performance.

Research attempting to link budget participation to budget slack also provides inconsistent results (Fisher et al. 2000; Hansen et al. 2003; Church et al. 2012). While these inconsistent findings do imply that budgetary participation independently is not a sufficient condition to impact budgetary outcomes (Chong and Chong 2002), previous attempts to examine the impact of different contingency variables (e.g., Shields and Young 1993, Gul et al. 1995, Chong and Bateman 2000, Hartmann 2000, Chong and Chong 2002, Lau and Lim 2002, Winata and Mia 2005, Agbejule and Saarikoski 2006; Venkatesh and Blaskovich 2012) do not provide a satisfactory understanding of the mechanisms involved.¹

One path towards the resolution of this question might be the possibility that the parameters that impact on the relationship between budgetary participation and budgetary outcomes differ between business sectors. A second potential starting point could be to examine the impact of factors related to the characteristics of the information exchange between organizational members during budgetary participation. The present paper builds on both these assumptions in attempting to contribute to knowledge about the relationship between budgetary participation and budgetary outcomes and its moderating influences. First, the authors focus on the manufacturing industry as a large and important business sector in many national economies, which also is the origin of participative management practices in relation to budgeting (Argyris 1952; Hopwood 1973). Second, the authors examine the impact of information technology for enhanced communication (ITEC) and activity-based costing (ABC) on the relationship between budgetary participation and budgetary outcomes. Arguably, ITEC and ABC represent two factors with potentially significant influence on the information exchange between plant managers and their superiors in manufacturing firms. Theorists indicate that traditional firms need to adapt to a digitized economic environment where the relationship between budgetary participation and budgetary outcomes is associated with the IT-

¹ In general, prior empirical studies on the effect of budgetary participation and budgetary outcome have used one contextual factor at a time.

infrastructure and prevailing cost management practices (Bhimani and Bromwich 2009).

Although proponents of ITEC long have argued that computerized communication technologies may support participative decision-making (Bettis and Hitt 1995; Barua et al. 1995; Brynjolfsson and Hitt 1998; Ragowsky et al. 2000) there is surprisingly scant evidence when it comes to the possibility that ITEC may influence the effect of budgetary participation on budgetary outcomes in manufacturing firms. While Winata and Mia (2005) found managerial performance in hotels to be positively associated with the interrelation between use of information technology and budgetary participation, the importance of budgets in manufacturing (Chong and Chong 2002; Umapathy 1987), the many inconsistencies in previous research and the underdeveloped literature at the intersection between management control and information technology (Granlund and Mouritsen 2003) suggest that a study addressing this relationship is warranted.

Advocates tend to describe ABC as an improved approach for the allocation of overhead costs, the management of operating costs, or as a managerial technology for the costing and monitoring of activities which involves tracing resource consumption and costing final outputs (Baird et al. 2004; Cohen et al. 2005; Gosselin 2007). Contemporaneously, they suggest that the use of ABC changes—and potentially illuminates—the processes of cost estimation, the level of detail of cost input to the budgeting process, and the obtainable variance feedback (e.g., Drake and Haka 2008).

Although there are some indications that cost management moderates the effect of budgetary participation on perceived managerial performance (Agbejule and Saarikoski 2006) these findings concern the impact of cost management knowledge. However, cost management knowledge is a different construct than the use of ABC, the latter which is the potential moderator of the relationship between budgetary participation and budgetary outcomes of interest here (Drake and Haka 2008).

This paper draws conceptually on prior studies (e.g., Maiga et al. 2014; Milgrom 1992; Milgrom and Roberts 1995), suggesting that the value of a resource brought to an organization might remain limited unless other complementarity factors are adopted and implemented as well. This suggests that, in a participative budget setting, there are indications that overall positive synergistic effects can be obtained through the support of ABC and ITEC (Cagwin and Bouwman 2002). Therefore, the aim of this study is to extend this line of research and to provide a better understanding of this area, by investigating:

1. The moderating effect of ITEC on the impact of budgetary participation on managerial performance and budgetary slack.
2. The moderating effect of ABC on the impact of budgetary participation on managerial performance and budgetary slack.

The results of this study indicate that ITEC significantly moderates the relationship between budgetary participation and managerial performance. ITEC does not moderate the relationship between budgetary participation and budgetary slack. ABC significantly moderates the relationship between budgetary participation and managerial

performance as well as the relationship between budgetary participation and budgetary slack. However, the influence of the predictors on budgetary outcomes are modest.

The study contributes to the literature by taking steps toward filling the gap in research between the literature on budgetary participation on the one hand and that of contemporary developments in management accounting (ITEC and ABC) on the other. To this end, this study suggests that budgetary participation may not have a significant direct impact on budgetary outcomes (Jermias and Setiawan 2008). Rather, the effect of budgetary participation on budgetary outcomes should be considered contingent on information technology and ABC although their impact would appear to vary with the nature of budgetary outcomes.

The remainder of the study is structured as follows. In Sect. 2, the authors present the definitions of the variables used in this study. In Sect. 3, the authors provide the background literature and develop the hypotheses. Research methods are presented in Sect. 4. In Sect. 5, the authors discuss the results. Finally, in Sect. 6, conclusions and future directions are presented.

2 Definitions

Budgetary participation is defined as a process whereby subordinate managers are given an opportunity to get involved in and have influence on the budget setting process (Brownell and McInnes 1986; Chong 2002) through information exchange with their superiors (Shields and Shields 1998). ITEC as a “...use of computer networks to enhance internal communication (intranet use) refers to data processing and information exchange that allow managers within the organization to communicate among each other” (Andersen 2001, p. 107). The intranet can contain many documents and large amounts of information and data prepared by employees in different departments and functions. Therefore, it can significantly facilitate information access and sharing within an organization (Winata and Mia 2005).

Seal et al. (2009) define ABC as “a costing method based on activities that is designed to provide managers with cost information for strategic decisions”. ABC was developed to overcome the limitations of traditional cost systems and the potential superiority of ABC relative to alternative cost systems for operational and strategic decisions is discussed in previous studies (Turney 1989; Kaplan and Cooper 1998).

Budgetary slack is typically defined as the financial and other resources controlled by a manager in excess of the amount optimal to accomplish his or her objectives, for example, overstated expenses, understated revenues, or underestimated performance capabilities. Budgetary slack often results from dysfunctional—even dishonest—behavior in which managers attempt to serve their own interests (Stevens 2000). In agency theory terms, such budgetary slack represents the magnitude of the miscommunication error between principal and subordinate managers with limited consideration of how budgets are subsequently used by managers for planning and control related purposes (Luft and Shields 2003; Brown et al. 2009). Managerial performance refers to the outcome of an individual manager’s effort (Winata and Mia 2005).

3 Background and hypotheses development

3.1 Background

Contingency theory studies postulate that organizational outcomes are the consequences of a fit or match between two or more factors. Prior research suggests that contingency theories facilitate an understanding of broad issues of management control (Selto et al. 1995; Chenhall 2006). Using contingency theory, considerable accounting studies identify how management control systems (MCS) in an organization can be best designed and used to match organizational situations within which MCS are employed. Drazin and de Ven (1985) developed the bivariate interaction fit notion of contingency theory of organizations that suggests that organizational MCS and contextual factors are likely to fit or align to affect performance (Donaldson 2001; Gerdin and Greve 2004; Chenhall and Chapman 2006).

The authors draw on these theoretical arguments and consider participative budgeting as an MCS, and ITEC and ABC as contextual factors. This is because (1) the authors argue that ITEC and ABC represent two factors with potentially significant influence on the relationship between budgetary participation and outcomes in manufacturing firms, and (2) theorists stress the interplay between budgetary control, IT and cost management (Bhimani and Bromwich 2009).

The authors use the moderating notion of contingency theory to empirically examine whether ITEC and ABC moderate the relationship between budgetary participation and budgetary outcomes. Figure 1 presents the theoretical model of the study. As shown in Fig. 1, both ITEC and ABC are the moderating variables, budgetary participation is the independent variable, and budgetary outcomes (i.e., budgetary slack and managerial performance) are the dependent variables.

Fig. 1 Conceptual model

3.2 Hypotheses development

3.2.1 *Budgetary participation, ITEC, and budgetary outcomes*

Information technology has been suggested to lead to the standardization of data collection formats and reporting (Granlund and Malmi 2002). In addition, information technology can provide organizational members with quick and effective access to the right amounts of information (Hope and Hope 1997), improve information exchange and interpersonal communication across functions, and provide instantaneous sharing of real-time information that enables faster and better decision outcomes (Ragowsky et al. 2000; Andersen 2001). By making necessary information available on a timely basis, information can be transferred throughout the organization (Andersen 2001). Furthermore, Kudyba and Vitaliano (2003) suggest that the enhanced flow of information brought about by information technology throughout the organization empowers decision makers to streamline operations by reducing unnecessary waste, such as idle factors of production (labor and capital). Aided by ITEC, organizational members can share individual interpretations of the budget information, thereby making consensus development more efficient. This suggests that the use of ITEC can play a moderating role for the relationship between managers' budgetary participation and budgetary outcomes.

Based on prior literature, it can be concluded that (1) budgetary participation by itself may not be a sufficient condition to improve budgetary outcomes, (2) the informational role of budgetary participation merely provides an opportunity to gather job-relevant information (Chong and Chong 2002), and (3) the use of ITEC allows managers to adjust their effort based on new information gathered through the process. Taken together, the authors argue that the impact of budgetary participation on budgetary outcomes may be contingent on the use of ITEC in two different respects: (1) the effect of budgetary participation in lowering budgetary slack may be contingent upon the use of ITEC, and (2) the effect of budgetary participation on improving managerial performance may be contingent on the use of ITEC. As suggested in the introduction section above, some support for this thesis is provided by Winata and Mia (2005), who found a significant moderating effect of ITEC on the relationship between budgetary participation and performance in the hotel industry. However, due to the importance of budgeting in manufacturing (Chong and Chong 2002), the inconsistencies in previous research and the modest level of knowledge about management control and ITEC (Granlund and Mouritsen 2003), there is reason for empirical study of these relationships.

H1a. The interaction between ITEC and budgetary participation is negatively associated with budgetary slack.

H1b. The interaction between ITEC and budgetary participation is positively associated with managerial performance.

3.2.2 *Budgetary participation, ABC, and budgetary outcomes*

Normative and popular writings in the area of cost management argue that the value of a cost-management initiative rests on its ability in producing new and/or more accu-

rate cost information (Van der Merwe and Keys 2002; Kaplan and Anderson 2004). According to this line of literature, a cost management initiative capable of generating new and/or more accurate cost information can potentially create value by enabling individuals to use the information to improve their decision performance. Therefore, today's organizations need modern MACS to adapt to the rapidly changing organizational and social environment (Abernethy and Lillis 2001; Williams and Seaman 2001; Baines and Langfield-Smith 2003; Cavalluzzo and Ittner 2004; Abernethy and Bouwens 2005; Emsley et al. 2006). More specifically, it is often claimed that modern cost management approaches, such as ABC, can benefit decision making by producing information that provides senior executives and other personnel with signals as to what is most important in their strategic and operational activities (Kaplan and Norton 1996; Hoque and James 2000; Chenhall 2003; Abernethy and Bouwens 2005; Drake and Haka 2008).

Activity-based costing seeks to provide management with clearer information regarding resource consumption (Hicks 2005). The major feature distinguishing ABC from other cost accounting methods, therefore, is its focus on the entity's processes, the activities and other costs required to perform those processes, the connection of those processes to the entity's outputs and, ultimately, the build-up of financial results in accordance with activities, processes, and outputs. When successful, the result can potentially be a fine-grained depiction of the resources used to create the entity's outputs, which is amenable for intervention (Jipyo 2009).

The above argument is in line with the contingency theory of management accounting choice, which suggests that firms are likely to perform more effectively if their management accounting suits their organizational and environmental situations (Chenhall 2003; Chenhall and Chapman 2006). For example, Tsui (2001) suggests that the provision of cost-related information is likely to complement budgetary participation by helping to make decisions and formulating budgets. More specifically, when ABC is integrated in the budgeting process, there can be more transparency (Hansen et al. 2003). Waeysens and Bruggeman (1994) found that when ABC information is used in budgeting, the incentive of biasing information by subordinate managers decreases (Hansen et al. 2003; Kaplan and Norton 2008). This suggests that, in a budgetary participation process, the use of ABC may benefit the effect of budgetary participation on budgetary slack and managerial performance. Cost management can moderate this relationship (Agbejule and Saarikoski 2006) but the specific impact of ABC remains untested despite the above assertions that promise important benefits (see also Drake and Haka 2008). Thus, the authors formulate the following hypothesis:

H2a: The interaction between ABC and budgetary participation is negatively associated with budgetary slack.

H2b: The interaction between ABC and budgetary participation is positively associated with managerial performance.

4 Research methods

4.1 Sample

To address the hypotheses, the authors surveyed a cross section of U.S. manufacturing plant managers. The authors requested and obtained from [Maiga and Jacobs \(2008\)](#) the sample of 691 firms used in their 2008 study. However, [Maiga and Jacobs \(2008\)](#) only included ABC firms in their study. Since our study included both ABC and Non-ABC firms, the authors did additional random sample selection of firms to include both ABC and Non-ABC firms, using Industry Week Annual Census of Manufacturers. To avoid any overlap during our sample selection process, the authors were careful not to add any firm already included in [Maiga and Jacobs \(2008\)](#) sample. These two samples led to a total 1,391 manufacturing plants in our initial survey sample. Questionnaires were pre-coded to enable non-respondents to be identified for a second mailing. A self-addressed, postage-paid envelope was attached for returning the completed questionnaire directly to one of the researchers. The survey cover letter described the objectives of the study and promised anonymity. The first and second waves of replies resulted in 374 responses (175 ABC adopters and 199 non adopters).¹ However, the following criteria were used for inclusion of the responses in the data analysis: (1) each participant had budget responsibility in the subunit; (2) each subunit was an investment center, (3) each manager held the position for at least 2 years with the business unit, and (4) a complete response. At least 2 years at the job would reflect a satisfactory knowledge level among the managers about the budgetary process at his or her organizational unit. The selection criteria were used to make sure that respondents had direct budget responsibility, reflecting a suitable setting for budget participation ([Hopwood 1973](#); [Burns and Waterhouse 1975](#); [Otley 1978](#)). This led to the exclusion of 26 responses. Additionally, 35 responses were excluded for incomplete responses. This process resulted in 143 usable responses for the Non-ABC group and 170 usable responses for the ABC group. In contrast to many prior budgetary studies with sample sizes far below 100 which may lack the power to find hypothesized interactions of a high-order ([Young 1996](#)) this study was based on a large sample size (see Table 1).

Control for common method biases was accomplished in two primary ways: the design of the study's procedures (procedural remedies) and statistical controls (statistical remedies). The design of the study's procedures consisted of (1) assuring respon-

Table 1 Summary of sample

	Total	Non-ABC	ABC plants
First wave of responses received	290	139	151
Second wave of responses received	84	36	48
Total sample received	374	175	199
Did not meet selection criteria	26	9	17
Incomplete responses	35	23	12
Usable responses	313	143	170

dents of anonymity (Podsakoff et al. 2003), and (2) careful construction of the variable constructs (Podsakoff et al. 2003). In order to address statistical remedies the authors applied Hartmann's one-factor test (Podsakoff and Organ 1986) which did not extract a single factor accounting for the majority of variance of all used items. This suggests that common method bias is not a problem with our data in general (Podsakoff and Organ 1986).

Social desirability bias, which means the tendency of respondents to fill in questionnaires in a manner that is viewed favorably by others, would affect the validity of using questionnaires as a research method (Nederhof 1985). To reduce social desirability bias for the variables used in this study, the authors use anonymity, the promise of confidentiality, and a request for honesty (Nancarrow et al. 2001). First, the respondents in this study do not have to reveal their names, titles, or company names in the questionnaires. It is meaningless for the respondents to overstate or to exaggerate the variables in the questionnaire. The levels of social desirability bias vary with the level of anonymity in the questionnaire. The more anonymity seems to be assured, the less social desirability bias is detected (Randall and Fernandes 1991). Second, this study keeps confidentiality at all times. The cover letter to the questionnaire states that the empirical results of the study are only for academic purposes and also contains the promise of confidentiality. Third, the respondents specifically were asked to complete the questionnaire honestly. The more honesty seems assured, the less social desirability bias is detected (Phillips and Clancy 1972). Hence, social desirability bias may not be an issue in this study.

4.2 Measurement of variables

The variables used to test the hypotheses were budgetary participation, ITEC, ABC, budgetary slack, and managerial performance. The Appendix contains an abbreviated copy of the research questionnaire used to measure the self-reported variables.

4.3 Budgetary participation

This variable was measured using the Milani 1975 six-item scale that has been used in prior studies (e.g. Otley and Pollanen 2000; Parker and Kyj 2006) (see appendix). The response scale was a seven-point Likert-type scale ranging from (1) "strongly disagree" to (7) "strongly agree" in order to increase the sensitivity of the measurement instrument.

4.4 Information technology for enhanced communication

In this study, ITEC consisted of Intranet, i.e., managers' use of computer networks to enhance internal communication among employees within an organization. The authors used a 3-item instrument to assess managers' perceived use of the intranet (ITEC in the current study): two of the items were established in prior research by Winata and Mia (2005), the third item was developed by the authors on the basis of prior

literature (e.g., [Andres 2002](#); [Sakthivel 2005](#); [Montoya et al. 2009](#)) (see appendix). Responses were collected on a seven-point Likert scale (ranging from 1 = “low use of ITEC” to 7 = “high use of ITEC”).

4.5 Activity-based costing

To measure ABC, the authors also chose to adopt an approach already established in prior research ([Krumwiede 1998](#); [Maiga and Jacobs 2008](#)); asking respondents to indicate which of the following methods that were used to allocate overhead cost: (1) Individual plant-wide overhead rate, (2) Departmental or multiple plant-wide overhead rates, and (3) ABC method. For the purpose of our study, the authors collapsed the first two categories into one category, representing plants that had not implemented ABC at the time of the survey. Hence, the authors measured ABC as 1 for ABC adopters and 0 for non-ABC adopters. The authors selected this approach because of indications in the literature suggesting that ABC systems can provide a higher level of cost information compared to traditional, volume-based costing systems that utilize volume-based cost drivers ([Swenson 1995](#); [Dearman and Shields 2001](#)).

4.6 Budgetary slack

Budgetary slack was measured using five-items. The questions were replicated from [Dunk \(1993\)](#) and [Van \(2000\)](#) studies (see appendix). On the first four questions, the response scale was a seven-point Likert-type scale ranging from (1) “definitely false” to (7) “definitely true” in order to increase the sensitivity of the measurement instrument. On the fifth question, respondents were asked to choose one of the following: The budget is (a) very easy to attain, (b) attainable with reasonable effort, (c) attainable with considerable effort, (d) practically unattainable, and (e) impossible to attain.

4.7 Managerial performance

Following prior studies ([Chong 2000](#); [Mia and Patiar 2002](#); [Chapman and Kihn 2006](#)), the authors measured managerial performance in relative (to peers) terms. Relative performance measurement has been useful in overcoming some potentially serious problems with absolute performance measures ([Kihn 2010](#)). The self-rating measure by [Mahoney et al. \(1963, 1965\)](#) which comprises a nine-item, seven-point Likert-scale was employed to evaluate managerial performance (see Appendix).²

² Among the subjective measures, self-rating and the superior’s rating models are commonly used ([Brownell 1979](#)). The extant literature suggests self-ratings of performance may be better than superior’s ratings as the first overcomes the problem of the ‘halo’ effect ([Heneman 1974](#)). For example, after an extensive discussion of the advantages and disadvantages of both the superior’s rating and the self-rating of managerial performance, [Brownell \(1979, p. 63\)](#) concludes, “when compared to self-rating of performance, superior’s rating fell far short on many desirable aspects.” This is perhaps a reason why self-rating of managerial performance has been consistently used by previous researchers ([Brownell 1979](#); [Brownell 1981](#); [Merchant 1985](#); [Brownell and McInnes 1986](#); [Mia and Patiar 2002](#)). Some researchers ([Brownell 1983](#); [Chong 2000](#)) have also argued that, in addition to overcoming the ‘halo’ effect, the self-rating of

Consistent with prior accounting studies (e.g., [Gul and Chia 1994](#); [Lau et al. 1995](#)) in which this instrument was used, the overall performance rating was used as the score for the dependent variable in data analysis in this study. A multiple regression analysis was performed by regressing the overall performance rating on the other eight items. An R^2 of 0.586 (adjusted $R^2 = 0.579$) was obtained. These results seem consistent with the claim of Mahoney et al. (1963, pp. 105–106) that the eight sub-dimensions should account for approximately 55 % of the variance of the overall rating.

4.8 Control variables

4.8.1 Firm size

Firm size was controlled for in statistical tests of the models. The authors expected firm size to be positively (negatively) related to budgetary slack (performance) because larger firms may suffer from agency problems ([Sun and Tong 2003](#)) and may attract more bureaucratic intervention and hence less efficient than small firms ([Xu and Wang 1999](#)). Also, as a firm gets larger, it would increasingly encounter problems of measurement, communication and control ([Hoque and James 2000](#)). *SIZE*, as measured by the number of employees, was standardized to have zero mean and a standard deviation of unity.³

4.8.2 Tenure

Tenure was used as control variable because managers with longer tenure tend to become more attitudinally committed their budgets due to having cognitively justified their remaining in an organization ([Cunningham et al. 2012](#)). Tenure, as measured by length of work at present position, was standardized to have zero mean and a standard deviation of unity.

4.9 Data analysis techniques

Moderated regression analysis was used to determine any statistically significant interaction effects ([Hartmann and Moers 1999](#); [Hartmann and Moers 2003](#); see also [Baron and Kenny 1986](#); [Shields and Shields 1998](#); [Cohen et al. 2003](#); [Gerdin and Greve 2004](#); [Gerdin and Greve 2008](#)). As explained by [Hartmann and Moers 1999](#), two regressions were run, one with the main-effects-only [cf. Eq. (1)] and another with both main effects and the interaction terms [cf. Eq. (2)]. Thus, as advocated by [Dunk \(2003\)](#), the interaction terms were included in a multiple regression. This approach was considered

Footnote 2 continued

performance is also more reliable and produces uninhibited responses from respondents when they are assured of anonymity and/or confidentiality. [Venkatraman and Ramanathan \(1987\)](#) found that managers' self-rating of their performance was less biased than researchers might expect, while [Abernethy and Lillis \(2001\)](#) found no evidence that managers are consistently lenient when rating their own performance.

³ The selection of manufacturing firms provided some degree of control for industry ([Lau and Moser 2008](#)).

equivalent to assessing the significance of the t-values associated with the interaction term-coefficients (see [Southwood 1978](#), p. 1168; [Arnold 1982](#), p. 157; [Hartmann and Moers 1999](#), 2003; [Cohen et al. 2003](#); [Jaccard et al. 2003](#); [Gerdin and Greve 2004](#); [Gerdin and Greve 2008](#)). Moreover, the main effects and the interactive effects of the independent variables could be analyzed separately ([Allison 1977](#); [Southwood 1978](#); [Schoonhoven 1981](#)). The following models were used:

$$Y_1 = \beta_0 + \beta_1 S + \beta_2 T \beta_3 X_1 + \beta_4 X_2 + \beta_5 X_3 + \varepsilon_i \quad (1)$$

$$Y_2 = \gamma_0 + \gamma_1 S + \gamma_2 T + \gamma_3 X_1 + \gamma_4 X_2 + \gamma_5 X_3 + \gamma_6 X_1 X_2 + \gamma_7 X_1 X_3 + \gamma_i \quad (2)$$

where Y = managerial performance or budgetary slack, S = size, T = tenure, X_1 = budgetary participation, X_2 = ITEC, X_3 = dummy variable for ABC (0 = non-ABC, 1 = ABC), and $X_1 X_2$, $X_1 X_3$ = interaction terms, and ε_i and γ_i are the error terms.

Equations (1) and (2) were used to analyze the main effects and the two-way interactive effects respectively. Deviation scores based on the overall mean score minus the raw scores were used for BP and ITEC variables in the regression models.

5 Results

In this section, the authors first present the descriptive statistics, followed by the measurement model. Next, the authors examine the hypotheses.

5.1 Descriptive statistics

The descriptive statistics in Table 2, Panel A, provide the profile of the sample used in the study, showing that they constitute a broad spectrum of manufacturers as defined by the two-digit SIC code. The sample composition has representation in electronic and electrical equipment (19.17 %), followed by food and kindred products (14.70 %), and instruments and related products (9.58 %). Additional information on respondents' characteristics is provided in Table 2, Panel B. Answers to the question regarding number of years with the manufacturing plant showed that the respondents have a mean of 11.43 years in their current position. To the number-of-years in management question (i.e., tenure), respondents indicated a mean of 16.96 years. It appears from their positions and tenure that the respondents are knowledgeable and experienced, have access to information upon which to provide reliable perceptions, and are otherwise well qualified to provide the information required. The results also show that the average number of employees is 983.

The authors factor-analyzed the survey items from budgetary participation, ITEC, budgetary performance, and budgetary slack utilizing principal components with varimax rotation. The Barlett Test of Sphericity value was significant ($p = 0.000$). The statistical probability and the test indicated that there was a significant correlation between the variables, and the use of factor analysis was appropriate. The Kaiser-Meyer-Olkin value was 0.917. The data was, therefore suitable for the proposed statistical procedure of factor analysis. The eigenvalues suggested that 4 factor solution

Table 2 Respondents' characteristics

	SIC	Total	Non-ABC	ABC
Panel A: Industry classification				
Food and kindred products	20	46	19	27
Textile mill products	22	7	4	3
Apparel and other textile products	23	24	11	13
Paper and allied products	26	14	9	5
Chemicals and allied products	28	11	6	5
Rubber and plastics products	30	24	9	15
Primary metal industries	33	13	7	6
Fabricated metal products	34	28	11	17
Industrial machinery and equipment	35	28	12	16
Electronic, electrical equipment	36	60	31	29
Transportation equipment	37	28	15	13
Instruments and related products	38	30	9	21
Total		313	143	170
	Minimum	Maximum	Mean	Standard deviation
Panel B: Other characteristics of respondents				
Length at present position (years)	4	19	11.43	3.82
Length in management (years)	9	22	16.96	3.47
Number of employees	571	1,697	983	214

be identified, representing approximately 78.667 % of the total variance. All retained factors had an eigenvalue greater than 1 and all factor loadings were above 0.60. The reliability coefficients (Cronbach's- α) ranged from 0.759 to 0.975. Table 3 presents the results of the factor analysis with its associated statistics.

Next, the authors calculated the mean and standard deviation for each of the latent variables used in the study and both Pearson (below diagonal) and Spearman (above diagonal) correlations. Table 4 presents summary statistics for these variables. Both Pearson and Spearman correlations are also reported in Panel B. The pair-wise Pearson correlations show significant correlations between budgetary participation and ITEC ($r = 0.146$), ABC ($r = 0.627$), managerial performance ($r = 0.165$), and size ($r = 0.125$). Also, significant correlations are demonstrated between ITEC and ABC ($r = 0.127$), budgetary slack ($r = 0.147$), and size ($r = 0.832$); between ABC and managerial performance ($r = 0.141$), and between managerial performance and budgetary slack ($r = -0.383$), and size (0.228). Tenure is significantly correlated with both ITEC (0.133) and managerial performance (0.139).

Previous research suggests that a mediation form of fit is preferable to moderation in cases where the moderator and the independent variables are correlated (Duh et al. 2006; Gerdin 2005; Gerdin and Greve 2004; Hartmann and Moers 2003; Shields and Shields 1998). However, such a path analytical approach would not allow for testing

Table 3 Factor analysis

	Factor loading	Eigenvalue	Explained variance	Reliability coefficient
Factor 1: Budgetary participation				
BP1	0.889	10.544	37.747	0.863
BP2	0.893			
BP3	0.828			
BP4	0.865			
BP5	0.879			
BP6	0.824			
Factor 2: ITEC				
IT1	0.870	4.592	19.561	0.830
IT2	0.865			
IT3	0.733			
Factor 3: Managerial performance				
PERF1	0.890	1.927	11.923	0.975
PERF2	0.879			
PERF3	0.914			
PERF4	0.869			
PERF5	0.873			
PERF6	0.879			
PERF7	0.853			
PERF8	0.905			
PERF9	0.866			
Factor 4: Slack				
Slack1	0.660	1.030	9.435	0.759
Slack2	0.664			
Slack3	0.683			
Slack4	0.665			
Slack5	0.683			

Note: Extraction Method—principal component analysis; Rotation method—Varimax with Kaiser normalization; KMO (Kaiser–Meyer–Olkin measure of sampling adequacy) = 0.917; Bartlett’s test of sphericity: $p = 0.000$

of interaction effects between context and MCS on performance (Gerdin and Greve 2004; Gerdin and Greve 2008). Moreover, Burkert et al. 2014 recently contested the conception of moderators and independent variables as ideally unrelated, suggesting that a long-run association between the two is an implication of contingency theory (see also Donaldson 2001; Meilich 2006). In addition, Burkert et al. (2014) argue that:

...statistically significant moderation effects should be interpreted and that any path model with performance as the dependent variable is outside the scope of contingency theory.

Table 4 Variable means (std. deviation), Pearson and Spearman correlations (N = 313)

	Total sample		Correlation matrix						
	Mean	Standard deviation	1	2	3	4	5	6	7
1. Budgetary participation	3.699	(1.392)	1	0.134**	0.618**	0.029	0.023	0.113*	0.063
2. Information technology for enhanced communication	4.194	(1.350)	0.146*	1	0.117*	0.134*	0.056	0.832**	0.133*
3. ABC	–	–	0.627**	0.127*	1	0.059	0.133*	0.137**	–0.048
4. Budgetary slack	4.205	(1.602)	–0.035	0.147**	0.065	1	–0.373**	0.235**	–0.099
5. Managerial Performance	4.297	(1.541)	0.031	0.064	0.141*	–0.383**	1	–0.318**	0.139*
6. Size	983.000	(214.000)	0.125*	0.832**	0.152**	0.228**	–0.317**	1	0.024
7. Tenure	11.430	(3.820)	0.066	0.138*	–0.048	–0.102	0.143*	0.027	1

Pearson (Spearman) correlations are below (above) the diagonal/Tenure Length at present position

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

In light of the above discussion, this study uses moderated regression analysis to test its hypotheses.

5.2 Regression results

Moderated regression analysis models such as Eq. 2 have been criticized from a multicollinearity point of view since the cross-product term is likely to be correlated with its constituting terms (Dewar and Werbel 1979). However, such collinearity can be eliminated through manipulation of the origin points of the continuous variables (Southwood 1978; Smith and Sasaki 1979; Gupta and Govindarajan 1993).

Therefore, in accordance with the procedures used by Maiga et al. (2014), the budget participation, ITEC, size and tenure variables were mean centered before entering to avoid nonessential multicollinearity. This does not affect the value or the significance of the regression coefficients.

Two statistical measures of multicollinearity are the tolerance (TOL) value and the variance inflation factor (VIF) (Hair et al. 2010). A low tolerance value indicates a high degree of collinearity. The VIF and TOL measures assume normality and are typically relative measures. A high tolerance value (above 0.10) and low VIF value (below 10) usually suggest a relatively small degree of multicollinearity (Hair et al. 2010). In all the regressions in Tables 5 and 6, the largest variance inflation factor was 3.722 and the lowest tolerance value 0.261, suggesting absence of bias in the standard errors of the regression coefficients among the model variables.

To test whether ITEC and ABC moderated the relationship between budgetary participation and budgetary outcomes, the authors conducted a moderated regression analysis. For each analysis the authors entered the main effects for the control variables (size and tenure), budgetary participation, ITEC and ABC in the first step. In the second step, the authors entered the main effects and interaction terms between budgetary participation and ITEC, and budgetary participation and ABC.

5.3 Results of regression of budgetary slack/managerial performance on budgetary participation, ITEC and ABC

Moderation may refer to the strength (mainly tested by subgroup correlation analysis) or the form of the relationship between variables (Venkatraman 1989). As discussed by Hartmann and Moers (1999, p. 297), contingency hypotheses are more of form type because researchers are mainly interested in the effect of the moderator variable on the slope of the regression line. This form type of moderation effect is also the main type of effect of interest to researchers in social sciences. Therefore, the authors focus on the form type.

Although the authors did not hypothesize for the main effects on budgetary slack, Eq. (1), Table 5 displays the results of the standardized coefficients of the main effects. It shows that Size is significantly related to budgetary slack ($\beta = 0.323$, $p = 0.001$). However, Tenure ($\beta = -0.085$, $p = 0.132$), budgetary participation ($\beta = -0.077$, $p = 0.281$), ITEC ($\beta = -0.108$, $p = 0.288$), and ABC ($\beta = 0.040$, $p = 0.574$) are not significantly related to budgetary slack. Equation (2), Table 5, assesses the mod-

Table 5 Results of moderated regression analysis with budgetary slack as dependent variable

	Equation (1)			Equation (2)		
	Standardized coefficient	T-value	p-value	Standardized coefficient	T-value	p-value
SIZE	0.323	3.215	0.001	0.330	3.333	0.001
TENURE	−0.085	−1.510	0.132	−0.082	−1.467	0.143
BP	−0.077	−1.081	0.281	0.325	1.907	0.057
ITEC	−0.108	−1.064	0.288	0.086	0.529	0.529
ABC	0.040	0.563	0.574	0.608	2.897	0.004
BP x ITEC				−0.368	−1.584	0.114
BP x ABC				−0.690	−2.847	0.005
R ²		0.070			0.108	
ΔR ²					0.038	
Adjusted R ²		0.055			0.087	
F (p-value)		4.649 (0.000)			5.251 (0.000)	

BP budgetary participation, *ITEC* information technology for enhanced communication, *ABC* activity-based costing, *SIZE* plant size, *TENURE* length at present position

erating effects. Results show that the moderating effect of ITEC on the relationship between budgetary participation and budgetary slack is negative, but not significant ($\gamma = -0.368$, $p = 0.114$), failing to support H1a. However, interaction terms show that ABC has a significant moderating effect on the influence of budgetary participation on budgetary slack ($\gamma = -0.690$, $p = 0.005$), supporting H2a. Also, in support for the moderating effect results, the F-value is significant ($F = 5.251$, $p = 0.000$), and after entering the interaction terms, R^2 significantly increased ($\Delta R^2 = 0.038$, $p < 0.05$).⁴

Results in Table 6 (Eq. 1) indicate that Size has a significant and negative main effect ($\beta = -0.456$, $p = 0.000$), and Tenure has a significant and positive main effect ($\beta = 0.121$, $p = 0.027$). The main effects of BP ($\beta = 0.086$, $p = 0.214$), ITEC ($\beta = 0.159$, $p = 0.106$), and ABC ($\beta = -0.050$, $p = 0.467$) are not significant. In Eq. 2, as predicted in H1b, results indicate that ITEC moderates the effect of budgetary participation on managerial performance. Specifically, the coefficient of the interaction term was positive and significant ($\gamma = 0.443$, $p = 0.044$). Similarly, H2b predicted that ABC would moderate the effect of budgetary participation on managerial performance. H2b was supported as Table 6 shows that the coefficient term was positive and significant ($\gamma = 0.464$, $p = 0.049$). In support of these results, Eq. 2, Table 5 also indicates significant F-value ($F = 8.426$, $p = 0.000$), and significant increase in R^2 after entering the interaction terms ($\Delta R^2 = 0.027$, $p < 0.05$).

5.4 Further analysis

As suggested by Burkert et al. (2014), the authors extended MRA to polynomial regression analysis (PRA). The purpose was to evaluate the extent to which thenon-

⁴ A low R-square does not necessarily imply a poor model (Rubinfeld 2000).

Table 6 Results of moderated regression analysis with managerial performance as dependent variable

	Equation (1)			Equation (2)		
	Standardized coefficient	T-value	p-value	Standardized coefficient	T-value	p-value
SIZE	-0.456	-4.699	0.000	-0.462	-4.822	0.000
TENURE	0.121	2.220	0.027	0.118	2.188	0.029
BP	0.086	1.244	0.214	-0.324	-1.962	0.051
ITEC	0.159	1.620	0.106	-0.085	-0.542	0.588
ABC	-0.050	-0.728	0.467	-0.434	-2.137	0.033
BP x ITEC				0.443	2.023	0.044
BP x ABC				0.465	1.977	0.049
R ²		0.135			0.162	
ΔR ²					0.027	
Adjusted R ²		0.121			0.143	
F (p-value)		9.592 (0.000)			8.426 (0.000)	

BP budgetary participation, *ITEC* information technology for enhanced communication, *ABC* activity-based costing, *SIZE* plant size, *TENURE* length at present position

linear terms (BP², ITEC², and ABC²) in the polynomial regression equation added substantially to the variance explained in budgetary outcomes. The quadratic equation of the polynomial regression can be represented as follows:

$$Y_3 = \alpha_0 + \alpha_1 S + \alpha_2 T + \alpha_3 X_1 + \alpha_4 X_2 + \alpha_5 X_3 + \alpha_6 X_1 X_2 + \alpha_7 X_1 X_3 + \alpha_8 X_1^2 + \alpha_9 X_2^2 + \alpha_{10} X_3^2 + \mu_i \quad (3)$$

where Y = managerial performance or budgetary slack, S = size, T = tenure, X_1 = budgetary participation, X_2 = ITEC, X_3 = dummy variable for ABC (0 = non-ABC, 1 = ABC), and $X_1 X_2$, $X_1 X_3$, = interaction terms, X_1^2 , X_2^2 , X_3^2 , are the squares of budgetary participation, ITEC and ABC, respectively, and μ_i is the error term.

The inclusion of the quadratic terms X_1^2 , X_2^2 and X_3^2 was made to assess whether the interaction terms entered in Step 2 of the MRA (Tables 5, 6) made a unique contribution to the prediction of the budgetary outcomes above and beyond the main effects of Step 1 and whether the quadratic terms entered in Eq. (3) made a unique contribution to the prediction of the criterion above and beyond all other effects. In other terms, a significant increase in R^2 resulting from the addition of the quadratic terms would indicate a non-linear relationship between the outcome and fit.

Tables 7 and 8 report the results from the PRA. Comparing R^2 in Table 5, step 2 of MRA (0.108) with R^2 in the PRA Table 7 (0.109), the increase in R^2 (0.001) is not significant. Similarly, comparing R^2 in Table 6, step 2 of MRA (0.162) with R^2 in the PRA Table 8 (0.167), the increase in R^2 (0.005) is not significant. The results indicate that entry of the quadratic terms in Tables 7 and 8 did not improve the prediction equation significantly.

Table 7 Results of polynomial regression analysis with budgetary slack as dependent variable

	Standardized coefficient	T-value	p-value
SIZE	0.328	3.310	0.001
TENURE	−0.082	−1.470	0.143
BP	0.113	0.286	0.775
ITEC	0.210	0.659	0.510
ABC	(*)	(*)	(*)
BP ²	0.250	0.549	0.583
ITEC ²	−0.131	−0.422	0.673
ABC ²	0.767	2.141	0.033
BP × ITEC	−0.345	−1.467	0.144
BP × ABC	−0.883	−2.063	0.040
R ²	0.109		
Adjusted R ²	0.082		
F (p-value)	4.115(0.000)		

BP budgetary participation,
ITEC information technology
 for enhanced communication,
ABC activity-based costing,
SIZE plant size, *TENURE* length
 at present position
 * ABC was excluded from the
 stepwise regression

Table 8 Results of polynomial regression analysis with managerial performance as dependent variable

	Standardized coefficient	T-value	p-value
SIZE	−0.461	−4.809	0.000
TENURE	0.119	2.202	0.028
BP	0.136	0.358	0.721
ITEC	−0.084	−0.271	0.786
ABC	(*)	(*)	(*)
BP ²	−0.602	−1.369	0.172
ITEC ²	−0.084	−0.271	0.786
ABC ²	−0.818	−2.362	0.019
BP × ITEC	0.479	2.103	0.036
BP × ABC	0.931	2.250	0.025
R ²	0.167		
Adjusted R ²	0.143		
F (p-value)	6.761 (0.000)		

BP budgetary participation,
ITEC information technology
 for enhanced communication,
ABC activity-based costing,
SIZE plant size, *TENURE* length
 at present position
 * ABC was excluded from the
 stepwise regression

6 Conclusions and future directions

This study contributes to the literature by taking steps towards filling the research gap between the literatures on budgetary participation on the one hand and that of contemporary developments in management accounting on the other. Integrating these research streams, the authors suggested that ITEC and ABC moderate the effect of budgetary participation on budgetary slack and managerial performance in manufacturing firms. Results from moderated regression analysis indicate that while ABC significantly moderates the relationship between budgetary participation and budgetary

slack, ITEC does not moderate this relationship. Results also indicate that both ITEC and ABC significantly moderate the relationship between budgetary participation and managerial performance. Further testing based on polynomial regression analysis indicates that the inclusion of quadratic terms does not improve the prediction equation significantly.

The findings have both theoretical and practical implications. ABC may be a suitable cost control system for manufacturing firms that face fierce competition, complex processes, and high importance of costs, as firms with such characteristics benefit from the associated processes of cost estimation, the level of detail of cost input to the budgeting process, and the obtainable variance feedback. ITEC can favorably impact the effect of budgetary participation on managerial performance as the costs of data collection and processing decline and managerial information availability improves. One reason why the enabling function of ITEC seems not affect budgetary slack might be that the information exchange between managers and superiors does not necessarily improve on this basis. However, these reasons for the relationships identified are tentative. Hence, they should not be interpreted as firm conclusions of this study. Nevertheless, this study broadens the literature on budgetary participation by identifying managers' use of ABC and ITEC as important supporting factors for effective budgetary participation. Hence, our findings support suggestions in the literature that it may be necessary to reconsider the ways in which budgets are being developed (Malmi and Brown 2008; Libby and Lindsay 2010).

Limitations of this study should be mentioned. First, a limitation for interpreting the results is that the explanatory values of the individual regressions were low. The low *r*-squares indicate that the model used did not properly catch all the relevant variables. This could result from a number of factors, including control variables not captured in this study which may impact budgetary outcomes (specification error and inherent cross-sectional variability of the dependent variables). This study only focused on firm size and tenure as control variables, and ITEC and ABC as moderating variables designed to reduce budgetary slack and to improve managerial performance. Desired reductions of budget slack and improved performance may be achieved through other variables, controlling for firm characteristics. Second, the study focused on the specific situation where managers are allowed to participate in budgetary setting. Further study may be needed to assess budgetary outcomes in case of a tight control environment where coordination is important and superiors might refrain from letting managers participate in budgeting.

A third limitation is that our study examines ITEC exclusively in terms of computer networks to enhance internal communication (intranet use), ABC in terms of cost control system. One useful extension might therefore be to measure ITEC in a broader way, by also capturing the Internet, and the use of other types of cost control and cost management systems (i.e., benchmarking, target costing, balanced scorecard) in further studies to assess their role in budgetary participation-budgetary outcomes relationships. Fourth, as the sample was derived from U.S. manufacturing firms, the results of this study can only be generalized to this sector of the economy. Opportunities exist to extend this study to managers in other industries and other countries.

In addition to these study specific limitations, there are other issues associated with contingency-based research in general (Cadez and Guilding 2008). One particular

issue revolves around the endogeneity problem arising when a researcher seeks to appraise whether a particular management accounting practice or action is associated with performance (Chenhall 2003; Chenhall and Moers 2007; Ittner and Larcker 2001).

Despite the limitations above, this study provides additional evidence regarding the complex issue of budgetary slack and managers' performance. The focus on budgetary participation and the role of ITEC and ABC to counter slack and improve managerial performance represents an interesting and relatively unexplored area in accounting research.

7 Appendix

Questionnaire

Please answer the questionnaire (or pass it to the most appropriate person within the plant and return it to the address mentioned in the cover letter.

The answers in this questionnaire will be treated in the strictest confidence and no information gained from this survey will be identified with any particular person or manufacturing plant.

Part I

Budgetary participation (Milani 1975; Otley and Pollanen 2000; Parker and Kyj 2006)

1 = strongly disagree	7 = strongly agree						
1. I am involved in setting all of my budget		1	2	3	4	5	6 7
2. My supervisor clearly explains budget revisions		1	2	3	4	5	6 7
3. I have frequent budget-related discussions with my supervisor		1	2	3	4	5	6 7
4. I have a great deal of influence on my final budget		1	2	3	4	5	6 7
5. My contribution to the budget is very important		1	2	3	4	5	6 7
6. My supervisor initiates frequent budget discussions when the budget is being prepared		1	2	3	4	5	6 7

Managers' use of information technology for enhanced communication (ITEC) (Winata and Mia 2005; Authors).

1 = not at all	7 = to a great extent						
1. To what extent do you use e-mail to communicate or exchange work-related information with others within your plant?		1	2	3	4	5	6 7
2. To what extent do you use computer network to access work-related information and data from within your plant?		1	2	3	4	5	6 7
3. To what extent do you use video conferencing for your work-related purposes.		1	2	3	4	5	6 7

ABCs (Krumwiede 1998; Maiga and Jacobs 2008)

Different overhead cost allocation methods are used in various business settings. Of the following three overhead cost allocation methods, please indicate the method used at your plant

A. *Individual plant-wide overhead rate*: allocates all indirect manufacturing costs via a single overhead cost rate (e.g., 200% of direct labor, etc.).

B. *Departmental or multiple plant-wide overhead rates*: allocates all indirect manufacturing costs using either different rates by department or multiple plant-wide rates (e.g., 66.2 percent, 90 percent, 200 percent, etc.).

C. *Activity-Based Costing Method ("ABC")*: assigns indirect costs to individual activity (rather than departmental) costs pools, then traces costs to users activities (e.g., products, customers, etc.) based on more than one cost driver.

Question:

Which of the above overhead cost allocation methods (A, B or C) is used at your plant? Please tick against A, B or C below.

- A _____
B _____
C _____

Budgetary slack (Dunk 1993; Van der Stede 2000)

1 = definitely false	7 = definitely true
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1. I succeed in submitting budgets that are easily attainable	1	2	3	4	5	6	7
2. Budget targets induce high productivity in my business unit (reverse coded),	1	2	3	4	5	6	7
3. Budget targets require costs to be managed carefully in my business unit (reverse coded),	1	2	3	4	5	6	7
4. Budget targets have not caused me to be particularly concerned with improving efficiency in my business unit,	1	2	3	4	5	6	7
5. Please choose one of the following regarding your budget"							
The budget is (a) very easy to attain _____							
(b) attainable with reasonable effort _____							
(c) attainable with considerable effort _____							
(d) practically unattainable _____							
(e) impossible to attain _____							

Managerial performance (Chong 2000; Mia and Patiar 2002; Chapman and Kihn 2006)

	1 = significantly above average				7 = significantly below average			
1. Planning	1	2	3	4	5	6	7	
2. Investigating	1	2	3	4	5	6	7	
3. Coordinating	1	2	3	4	5	6	7	
4. Evaluating	1	2	3	4	5	6	7	
5. Supervising	1	2	3	4	5	6	7	
6. Staffing	1	2	3	4	5	6	7	
7. Negotiating	1	2	3	4	5	6	7	
8. Representing	1	2	3	4	5	6	7	
9. Rate your overall performance	1	2	3	4	5	6	7	

Part II

Please answer the following:

1. What is your plant two-digit SIC code? _____
2. Number of years at this position? _____
3. Number of years in management? _____
4. What is the number of employees at your plant? _____

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