

The Association Between Activity-Based Costing And Improvement In Financial Performance

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ABSTRACT

This study investigates the improvement in financial performance that is associated with the use of Activity-Based Costing (ABC). Internal auditors furnish information regarding company financial performance, extent of ABC usage, and enabling conditions that have been identified in the literature as affecting ABC efficacy. Confirmatory factor analysis and structural equation modeling are used to investigate if, and under what conditions the use of ABC is associated with improved financial performance.

Results show that there indeed is a positive association between ABC and improvement in ROI when ABC is used concurrently with other strategic initiatives, when implemented in complex and diverse firms, when used in environments where costs are relatively important, and when there are limited numbers of intra-company transactions. In addition, measures of success of ABC used in prior research appear to be predictors of improvement in financial performance.

Key Words: Activity-Based Costing, new business initiatives, ABC success, structural equation models.

Data Availability: Contact the first author.

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INTRODUCTION

Activity-Based Costingⁱ (ABC) has been promoted and adopted as a basis for making strategic decisions and for improving profit performance (Kaplan and Norton 1992; Turney 1992; Cooper and Kaplan 1991b). In addition, as Kaplan (1990) predicted, ABC information is now also widely used to assess continuous improvement and to monitor process performance. Although ABC has found rapid and wide acceptance, there is significant diversity of opinions, however, regarding the efficacy of ABC (McGowan and Klammer 1997). Despite managers' insistence that management accounting systems pass the cost-benefit test (Foster and Young 1997), there still is no significant body of empirical evidence to validate the alleged benefits of ABC (Shim and Stagliano 1997; McGowan and Klammer 1997). Empirical research is needed to document the (financial) consequences of ABC implementation (McGowan 1998).

The purpose of this study is to measure the improvement in financial performance that is associated with ABC use. The research instrument is a cross-sectional mail survey of 1,058 internal auditors, claimed to be knowledgeable and unbiased in the assessment of cost systems (Tanju and Helmi 1991; Ray and Gupta 1992). Confirmatory factor analysis and structural equations modeling using LISREL8 (Joreskog and Sorbom 1993) are used to test a model hypothesizing the conditions under which there is a positive association between (time-impacted) use of ABC and change in financial performance. Control is provided for the moderating effects of concurrent use of other strategic management initiatives (e.g., TQM, JIT), and enabling conditions identified by prior research. In addition, this study tests the association between improvement in financial performance and previously used measures of ABC efficacy, as suggested by Foster and Swenson (1997).

This study enhances previous research on ABC in four ways. One, it employs internal auditors who constitute a less biased, more objective and knowledgeable source of ABC performance. Prior research has used respondents with a personal stake in ABC, such as controllers or ABC project managers (e.g., Shields 1995; Swenson 1995; Krumwiede 1996, 1998). Second, it specifically identifies non-user control firms. Prior research either didn't use control firms (e.g., Swenson 1995; Shields 1995), or used a binary measure of implementation derived from archival sources where non-users were identified by default based on lack of public information regarding implementation (e.g., Balachrishnan et al. 1996; Huson and Nanda 1995; Kinney and Wempe 1998). Third, this study tests a specific measure of improvement in *financial* performance, as opposed to unobservable general constructs such as perceptions of "success," "satisfaction," or "financial benefit." And finally, it tests a structural model synthesized from prior theoretical research, describing the conditions under which ABC should be successful.

Results show that positive synergies are obtained from concurrent use of ABC with other initiatives. In addition, positive associations between ABC and improvement in ROI are reported when ABC is implemented in complex and diverse firms, in environments where costs are relatively important, and when there are limited numbers of intra-company transactions to constrain benefits. There is also some indication that other enabling conditions (information technology sophistication, absence of excess capacity, and a competitive environment) affect the efficacy of ABC as expected, and that manufacturing firms may obtain greater benefits than non-manufacturing firms. Finally, there is some evidence that previously used measures of ABC success (Shields 1995; Swenson 1995; Krumwiede 1996, 1998) are predictors of improvement in financial performance.

The remainder of the paper is organized as follows. The next section relates background regarding ABC and situates this study in the context of prior research. Subsequent sections develop hypotheses, describe research methodology including model specification, discuss data collection procedures, and present the results.

PRIOR RESEARCH ON ABC AND FINANCIAL PERFORMANCE

Activity Based Costing

ABC has received a great deal of attention as a cost management innovation. A review of leading journals for practicing management accountants, *Management Accounting* and the *Journal of Cost Management*, revealed that ABC accounted for 35 percent of the articles published over the period 1994-1996. Numerous proponents of ABC argue that its methods are necessary to trace overhead costs to cost objects, and thus properly account for batch and product-level costs (Cooper 1990), manufacturing complexity (Jones 1991), specialty product costs (Srinidhi 1992) and diverse business environments (Cooper and Kaplan 1988).ⁱⁱ Many also recommend using ABC to support process improvement (Turney 1991) and to develop cost-effective product designs (Cooper and Turney 1989). Although ABC systems are most often associated with manufacturing companies, they can be applied in all types of organizations (Rotch 1990; Tanju and Helmi 1991).

The theories of diffusion of innovations (Kwon and Zmud 1987), transaction cost economics (Roberts and Sylvester 1996), and information technology (Dixon 1996) suggest that organizations adopt an innovation such as ABC to obtain benefits that directly or indirectly impact *financial* performance measures. Evidence regarding the benefits of ABC, however, is largely restricted to theoretical models and anecdotal information obtained from case studies and often related by practitioners (e.g., Barnes 1991; Brimson 1991; Bruns and Kaplan 1987; and

Harris 1990). Empirical research on the efficacy of ABC has generally consisted of modeling the factors that lead to successful ABC systems and has relied on the potentially biased judgements of firm personnel that have a personal stake in that success (management accountants, accounting managers, controllers, and ABC facilitators or champions). Success has been defined as “use for decision making” (Cotton 1993; Lukka and Granlund 1994; Innes and Mitchell 1995; Krumwiede 1996, 1998), “satisfaction” with the costing system (McGowan and Klammer 1997; Swenson 1995; Shields 1995), perceived “financial benefit”-- a dichotomous measure with no reference to the criteria of benefit (Shields 1995; Krumwiede 1996, 1998), or “other non-financial benefits” (McGowan 1998). There has been no empirical evidence that demonstrates that ABC improves financial performance.

Other Strategic Business Initiatives

ABC is one of many new strategic business initiatives that include TQM (total quality management), JIT (just-in-time), BPR (business process reengineering), and FMS (flexible manufacturing systems). Although researchers have attempted in recent years to link the use of these initiatives to improved financial performance, they have had limited success (see Table 1 for a detailed summary of these studies). Huson and Nanda (1995) find that JIT adopters have enhanced earnings per share after controlling for average industry unit costs, margins, turnover and employees per sales dollar. Kaynak (1996) finds that “financial and market” performance are enhanced for firms using both TQM and JIT purchasing. Easton and Jarrell (1995) find evidence that a very broadly defined TQM is associated with the variance between actual financial performance and that forecasted by Value-Line analysts. Kinney and Wempe (1998) report that JIT positively affects ROI in the three to four year period following JIT adoption.

INSERT TABLE 1 HERE

Unfortunately, none of these studies include controls for concurrent use of other initiatives and therefore the findings cannot be attributed specifically to single initiatives. In addition, Kaynak's (1996) measure of performance is not truly a measure of financial performance, but a combination of level and change measures of financial and market factors (e.g., market share). He also relies on self-reported responses of potentially biased quality managers. Easton and Jarrell (1995) define TQM in a manner that includes initiatives and management practices other than TQM, and measure deviation from Value-Line forecasts, which may or may not have incorporated subjective valuations of the initiative. Huson and Nanda (1995) use a five-equation simultaneous equation that emphasizes JIT's effect on inventory turnover and inventory turnover's effect on EPS, thereby ignoring JIT's effect on the level of non-inventory investment. Kinney and Wempe (1998) selected their JIT adopters from firms disclosing the use of JIT in the MD&A. However, one would expect successful firms to be much more likely to disclose their JIT adoption than unsuccessful firms. Also, although Kinney and Wempe matched on industry, accounting, and size, they didn't match on prior level of income (ROI).

One possible reason for the limited success of most studies is their reliance on public sources of information to identify users and non-users. Non-users are typically defined as companies where there is no *public* discussion of adoption of the initiative (Balachrishnan et al. 1996; Biggart 1997; Huson and Nanda 1995; Kinney and Wempe 1998). Consequently, many firms that adopted the initiative may be incorrectly classified as non-adopters because of the lack of publicly released implementation information. In addition, public announcement of adoption is not a reliable measure of the primary determinant of the efficacy of the innovation, the extent of diffusion throughout the organization.

Other limitations of previous studies include:

- Inadequate sample size because of the difficulty of identifying users that also release financial information (Dusseau 1996, sample size of 10; Balachrishnan et al.1996, 92; Biggart 1997, 85; Engelkemeyer 1991, 9; Boyd 1996, 115).
- Reliance on responses furnished by potentially biased subjects to measure the variables of interest (Dixon 1996; Shields 1995; Kaynak 1996; Easton and Jarrell 1995).
- Failure to control for the effect of concurrent use of multiple initiatives.
- Measurement of the *level* of financial performance rather than the *change* in financial performance (Dixon 1996; Boyd 1996; Engelkemeyer 1991; Kaynak 1996). Use of levels is a weakness in that performance improvement after implementation is not accurately captured by an attained level of performance if the level was very low before implementation; conversely, high performers may have attained their level before implementation of the initiative.

DEVELOPMENT OF HYPOTHESES

Direct Association of ABC with Change in Financial Performance

The arguments in support of ABC are generally based on the comparative advantage that firms can obtain from the superiority of information generated through ABC. Although ABC has strong theoretical underpinnings, Kaplan (1993) and other researchers caution practitioners that not every ABC system will produce these benefits. The issue of whether increasing use of ABC is directly associated with improvement in financial performance, without regard to firm and industry-specific environmental conditions, has not been empirically tested. This leads to the following hypothesis (in alternate form):

H1: There is a positive association between the extent of use of ABC and relative improvement in financial performance (compared to other firms in the industry).

Enabling Conditions

Previous research (e.g., Pattison and Arendt 1994; Estrin et al. 1994; Cooper and Kaplan 1991a) has identified specific environmental conditions (such as complexity and competition) that affect the potential benefits from the use of ABC. The theory supports the proposition that under appropriate “enabling conditions” the improved costing information provided by ABC leads to improved decision-making, and therefore should be associated with improved performance. This leads to the following hypothesis (in alternate form):

H2: The association between the extent of use of ABC and relative improvement in financial performance is impacted by specific enabling factors.

The specific enabling factors identified in this study (and the predicted direction of impact) are as follows:

- Importance of costs (positive).
- Information technology sophistication (positive).
- Business unit complexity (positive).
- Level of intra-company transactions (negative).
- Unused capacity (negative).
- Competition (positive).

Measures of ABC Success and Change in Financial Performance

Previous researchers have developed and tested theories regarding the determinants of ABC “success.” Success been operationalized by survey items asking if respondents believed that the system had been “successful” (Shields 1995), whether they were “satisfied” with their cost systems (Swenson 1995), whether ABC had been “worth implementing” (Krumwiede 1996, 1998), or what was their level of satisfaction with the implementation of ABC (McGowan and Klammer 1997). Researchers have implicitly assumed that “successful” ABC systems lead to improved financial performance. However, this relationship between perceived success and specific measures of financial performance has not been tested. Moreover, when examining

alternative measures of ABC success, Foster and Swenson (1997) found that pairwise correlations between alternate “success” measures were “sizably less than 1.00” (0.45 to 0.75). Consequently, the current study tests the relationship between several reported measures of success with improvement in financial performance through the following hypothesis (in alternate form):

H3: A firm’s relative improvement in financial performance (compared to other firms in the industry) is positively associated with the level of “success” of ABC.

The specific measures of “success” examined in this study include:

- “Perceived success” of the ABC implementation.
- “Satisfaction with the cost system.”
- Expressed belief that ABC has been “worth implementing.”

Rejection of the null hypotheses would support of the appropriateness of “success” constructs used in prior ABC studies, and would enhance the credibility of both this study and previous research by providing a tie between ABC “success” and financial performance.

MODEL DEVELOPMENT -- RESEARCH DESIGN

The impact of ABC on financial performance is examined using the following model:

$$\Delta\text{ROI} = f(\text{ABC}, \text{Enabling Variables}, \text{Control Variables})$$

where ΔROI is the change in return on investment measured for period t-5 through t. The relationships between the variables are presented graphically in Figure 1. The figure shows that ABC (the extent of ABC use) is a construct that consists of four components: the organizational functions using ABC, the applications for which ABC is used, the level of integration of ABC into firm strategic and performance evaluation systems, and length of time since implementation. The figure also identifies six specific enabling conditions: information technology, complexity/diversity, importance of costs, intra-company transactions, unused capacity, and

competition. Control variables include firm size and type. In addition, the model includes the use of other strategic initiatives, such as JIT and TQM, in order to capture possible synergies between ABC and those initiatives.

INSERT FIGURE 1 HERE

The remainder of this section describes the variables contained in this model. Variable names are capitalized (see Figure 1). Figure 1 also identifies the specific questionnaire items measuring each construct. The complete questionnaire is included in the appendix.

Most constructs are latent constructs composed of two or more manifest variables. Composite scores of multiple variables have the advantage of capturing more of a construct's multi-dimensionality than individual questions (Foster and Swenson 1997). Use of multi-item measures also reduces the effect of random and measurement errors, and structural coefficients obtained are less biased than those obtained using manifest variables alone (Libby and Tan 1994).

Dependent Variable

Change in return on investment (Δ ROI). The most common investment center performance measure is return on investment (Hilton 1994). Seven recent studies that attempted to link the implementation of JIT or TQM to improved financial performance used ROI as a measure of financial performance (Balakrishnan et al. 1996; Biggart 1997; Boyd 1996; Dixon 1996; Engelkemeyer 1991; Easton and Jarrell 1995; Kinney and Wempe 1998). Furthermore, previous research shows a high correlation between ROI and other profitability measures (Prescott et al. 1986) and suggests that ROI is more readily available in business units than other measures (Jacobson 1987).

Using the *change* in ROI (Δ ROI) is an attempt to control for the level of ROI *prior* to ABC implementation. Δ ROI is also industry median-adjusted to control for differences between industries. Table 2 summarizes the definitions of this and subsequent variables.

INSERT TABLE 2 HERE

Self-reported vs. archival measures of performance

This study, like most research attempting to link strategic initiatives to financial performance, relies on a self-reported measure of performance. However, as noted by Young (1996), self-reported performance is not necessarily a valid proxy for actual performance.ⁱⁱⁱ Management accounting research has been silent on this issue (Young 1996).

In order to evaluate the accuracy of self-reported measures, a subset of the responses in this study was compared to actual financial statement information retrieved from Compustat. Fifty-four respondents reported company-wide information for firms that were included in the Compustat database. For those companies with complete information (ranging from 47 to 52 for an individual test), actual ROI, industry-adjusted by subtracting the median performance of the subject's primary 3-digit SIC code, was compared with the applicable 5-point Likert scale survey response. As shown in Table 3, the survey responses exhibit a high degree of reliability. Spearman correlation coefficients range from .71 for 5-year ROI change to .78 for 3-year ROI change. When the continuous measures obtained from Compustat are converted to ranks on the same basis as the survey responses, correlations are .76 for 5-year ROI change and .86 for 3-year ROI change. The majority of responses are identical (66.3 percent), and 99 percent of responses are within one value (e.g., report "4" on the survey and compute "5" from Compustat data).^{iv}

INSERT TABLE 3 HERE

Independent Variables

ABC use (ABC). Unless a system is used extensively, it seems unlikely that it can be significantly associated with financial benefit. One would expect the benefits received from an innovation to depend on the extent to which it becomes incorporated into organizational subsystems. Shields (1995) found that ABC success is significantly correlated with several categories of use: performance measurement, activity analysis, product costing, and reengineering. He also found significant correlation of success with the percentage of costs processed through ABC.

Shields (1995) also found evidence that the degree of linkage between ABC and performance evaluation and compensation is an important factor for ABC success. Employees pay more attention to those measures of performance that affect their personal welfare. Banker and Datar (1987) demonstrated that lack of coordination between incentive systems and performance measures can wreak havoc on a firm's performance. Swenson (1997) confirmed that use for both decision making and performance measurement are typical of the "best practices firms" studied.

Therefore, the construct ABC use (ABC) used in this study contains the following three aspects of use: breadth of use (**FUNCTION**), depth of use (i.e., applications for which ABC is used: **APPLIC**), and the level of integration into strategic and performance evaluation systems (**Eval**), as defined in Table 2. These three aspects capture the *extent* of ABC use.

Extent of (current) ABC use must be modified by the length of time since implementation occurred (**TIME**). Realization of the advantages of an innovation occurs when it is implemented on a widespread basis. This takes time. Evidence suggests that plant-level implementation does not move in lock step with corporate implementation (Swenson 1995). In addition, accounting

data has a historical focus; the benefits from use of ABC may not be measurable for several years.

According to the theories of diffusion of innovation, diffusion of initiatives like ABC in an organization is likely to occur in a non-linear manner (Kwon and Zmud 1987). Rogers (1983) suggests that diffusion of an innovation follows an S-shaped curve. As an organization moves up the curve, a greater number of individuals and units adopt the components of the innovation until a saturation point is reached on the upper plateau of the 'S.'

To determine the change in performance attributable to the ABC initiative over the measurement period, allowance must be made for the period of time during which benefits were or were not received. A simple interaction between "time since implementation" and current "extent of ABC use" would imply assumption of a linear, rather than a more appropriate S-shaped diffusion curve. Transformation of data to the form of the cumulative probability function of a normal distribution (cdf)^v allows simulation of the hypothesized S-shaped curve of diffusion. Therefore, the composite measure of ABC use (ABC) is constructed from the above three aspects capturing the extent of ABC use, multiplied by the time diffusion percentage as simulated by the cdf.

Other initiatives (INIT). Researchers have often noted that ABC and other strategic business initiatives complement and enhance each other, rather than being individually necessary and sufficient conditions for improvement (Anderson 1995a; Evans and Ashworth 1995; Cooper and Kaplan 1991a; Thorne and Gurd 1995; and Player and Keys 1995). Krumwiede (1998) provided additional weight to this argument by reporting that all fifteen "best practice" firms had linked ABC to another improvement initiative. Because ABC often provides more and better

information about processes, ABC may be most beneficial if other initiatives are employed concurrently. The variable INIT captures a firm's use of other strategic business initiatives.

Enabling Conditions

Prior research has suggested that the benefits of ABC are more readily realized under specific environmental conditions. Therefore, the following variables are incorporated into the model testing the efficacy of ABC (see Table 2 for variable specifications).

- **Information technology (INFO).** Cooper (1988) suggests that ABC becomes more beneficial as the cost of data collection and processing is reduced, which requires higher levels of information technology. Reeve (1996) suggests that an integrated ABC system presupposes a relatively high level of INFO sophistication with extensive and flexible information stratification and real-time activity driver information.
- **Complexity and diversity (COMPLEX).** Previous studies have confirmed that ABC data are most likely to differ from traditional cost data in settings with high coordination and control costs, such as those with diverse products, processes, customer demands, or vendors (Foster and Gupta 1990; Cooper and Kaplan 1991a; Pattison and Arendt 1994; Estrin et al. 1994; Anderson 1995b; Banker et al. 1995).
- **Importance of costs (IMPORT).** Even if ABC could substantially reduce product cost distortions, it is not likely to be helpful unless a firm can actually utilize better cost information in its decision making process. Besides competitive environment, other factors affecting the decision usefulness of cost information include the firm's use of cost data in pricing decisions, cost reduction efforts, need for special cost studies, strategic focus, and average profit margin (Estrin et al. 1994).

- **Intra-company transactions (INTRA).** When companies have a large number of intra-company transactions, the financial performance of individual business units may be misleading because of transfer pricing methodology, and constraints on decision-making regarding source of supply and customer selection (Swenson 1995). Therefore, intra-company transactions are a potentially confounding variable to this study.
- **Unused capacity (CAPAC).** ABC theory predicts that due to improvements in resource usage or cost-reduction programs, unused capacity will be created, particularly with respect to batch and product-sustaining activities. If managers have acted to eliminate these unused capacities, then the effects of ABC would show up through lower costs. If, however, managers have not eliminated these unused capacities, then the non-valued added costs identified by ABC may not translate into cost reductions or profit improvements (Kaplan 1993).
- **Competition (COMP).** As competition increases, there is a greater chance that a competitor will exploit any costing errors made. In addition, research has shown that competitive situations where combinations of firms have significant market power (oligopoly) can lead to optimal, strategic costing systems that have more in common with traditional mark-ups than with ABC (Alles 1990; Banker and Hughes 1991; Banker and Potter 1991). Thus, more reliable cost information may be needed as competition increases (Cooper 1988).

Control Variables

Business unit size (SIZE). The literature proposes two conflicting effects for the interaction of firm size with ABC. Anderson (1995a) concluded that implementation is most likely to be disruptive if it occurs over a protracted period. Large, vertically integrated firms are more likely to have lengthy implementation processes that cause significant organizational

disruption. However, Selto and Jasinski (1996) reason that, other than in large companies that are well staffed and well trained, ABC is not sufficiently understood to be implemented successfully as a stand-alone system, let alone being integrated within a company's strategy. The combination of the time and firm size variables provide control for the organizational disruption anticipated by Anderson (1995a). The identification of breadth and depth of use of ABC provides control for the small company resource problems noted by Selto and Jasinski (1996).

Type of company (TYPE). Georgantzas and Shapiro (1993) and Schroeder (1990) analytically demonstrated that industry type moderates the relationship between innovation and performance. In this study, macro-economic differences between industries are controlled through the use of industry-adjusted dependent variables, eliminating the need to model a direct effect. Firm-specific conditions affecting ABC are measured through enabling condition variables. However, ABC research also suggests that the efficacy of initiatives may fundamentally differ between manufacturing and service companies (Rotch 1990; Cooper 1988, 1989). Therefore, a binary variable differentiates the 106 manufacturing firms from the 98 non-manufacturing firms and is interacted with ABC.

ABC Success.

The variables of interest in testing Hypotheses 3, which associates previously reported measures of "ABC success" with improvement in ROI, are those developed by Shields (1995), Swenson (1995), and Krumwiede (1996, 1998). Figure 2 shows the changes that need to be made to the ABC model described thus far. The section that modeled ABC use is replaced by single item measures of SUCCESS, SATISFACTION, and financial BENEFIT, respectively (Table 2).

INSERT FIGURE 2 HERE

SAMPLE SELECTION AND SURVEY INSTRUMENT

Subjects

As noted by Shields (1995), one of the limitations of previous research is that results may have been weakened because of being based on responses provided by potentially biased subjects, those responsible for design, implementation, and operation of the innovation.^{vi} For example, McGowan and Klammer (1997) and Foster and Swenson (1997) found that perceptions of ABC vary depending on the role of the individuals involved –preparers reporting more favorable attitudes toward ABC than users, with project leaders or champions being most favorable.

The current study mitigates this limitation by utilizing internal auditors as subjects. The *Statements of Responsibilities in Internal Auditing* (IIA 1990), and Section 100 of the *Standards of Practice for Internal Auditors* (IIA 1995) require that internal auditors be independent of the activities they audit. “Independence permits internal auditors to render impartial and unbiased judgments” (Standards, Section 100.01). In addition to their independence and objectivity, internal auditors are appropriate subjects because they are knowledgeable, possess varied talents and expertise, and have access to relevant information (Tatikonda and Tatikonda 1993; Stoner and Werner 1995).

Population and Sampling Procedures

The firms studied are “for profit” firms that employ internal auditors who are members of the Institute of Internal Auditors (IIA). The sample is drawn from the population of those practicing members of ten geographically diverse U.S. chapters of the Institute of Internal Auditors (IIA)^{vii} where information was available to the researchers. Auditors employed in the banking industry were excluded because they often have highly specialized responsibilities,

limiting their exposure to new business initiatives. Auditors employed by governmental and non-profit organizations were excluded as well since those organizations do not measure improved financial performance as improvement in profitability (ROI). Sample size is further limited to five randomly drawn subjects per organization.^{viii} A mail survey was used to collect the information.

The questionnaire was distributed to 1,058 internal auditing professionals. This sample was reduced by 68 that were returned unopened because of incorrect address or change of employment with no forwarding address (see Table 4). In addition, 28 uncompleted or partially completed surveys were returned because the subjects were not knowledgeable about their company's systems, company policies against response to surveys, or other reasons, leaving an adjusted sample size of 962. Of 204 usable responses, 137 are from the first and 67 from the second mailings, yielding a response rate of 21.2 percent. Sixty-five responses (31.8 percent) indicate some use of ABC. The remaining 139 respondents serve as a non-using control group. The number of responses is adequate for purposes of statistical analysis.^{ix}

INSERT TABLE 4 HERE

There is no test to ensure that the study is free of non-response bias. Two separate procedures were performed to help assess the possibility of bias. As in Gosselin (1997) and Krumwiede (1998), a "reason for non-response" section was included at the bottom of the transmittal letter. In addition, the median responses of the first mailing were compared to those of the second mailing. Wilcoxon 2-sample signed rank tests (Hollander and Wolfe 1973) and Pearson chi-square tests of proportions (Feinberg 1983) on both the raw data and the additive indexes revealed significant differences ($p < .05$) on five of the 75 variables tested, or 6.7 percent. This is slightly more than would be expected by chance. Second mailing respondents tended to

report at a somewhat higher level of aggregation (e.g., company vs. division; median 4.82 vs. 4.29 – $p < .0385$), have less tendency to be manufacturers (.42 vs. .57 -- $p < .044$), to be less likely to use CIM (.10 vs. .22 -- $p < .047$), and tended to be less satisfied with their business unit cost (3.20 vs. 2.91 -- $p < .041$) and performance measurement (3.18 vs. 2.87 – $p < .033$) systems. It is not surprising that the test revealed some differences. For example, a possible explanation for slower responses by internal auditors with company-wide responsibilities is that they tend to travel more often, and are thus likely to have delayed responses.

Survey Instrument

Data were extracted from a 96-item survey instrument. As in Kaynak (1996), Shields (1995), Swenson (1995), Grandzol and Gershon (1997), McGowan and Klammer (1997), and Krumwiede (1996, 1998) the instrument was constructed so that analysis could be conducted at the appropriate level of knowledge of the individual respondents (plant, division, region, subsidiary, country, or entire company). This reduced measurement error associated with differing levels of ABC use in different segments of firms. As described in the variable descriptions, many survey items were adapted from previous research.^x The survey instrument is included in the appendix.

RESULTS

Descriptive Statistics

204 completed questionnaires were returned. Fifty percent of the respondents reported for their entire company, 17.2 percent reported for their division, with the remainder spread among plant, group, subsidiary, and country business units. 46.6 percent reported that their business unit revenues exceed \$1 billion, while, as is not surprising for firms employing internal auditors, only

8.3 percent reported for business units with revenues under \$50 million. Manufacturing firms constituted 52 percent of the responses.

As reported in Table 5, all but 45 (22.1 percent) of the respondents indicated that their business unit was significantly using at least one business initiative. The median firm used two practices (range from zero to six) with JIT and TQM the most often referenced at 46 percent. Manufacturers had more mean use (2.56 vs. 1.32) than non-manufacturers and companies over \$1 billion in revenues had higher use than smaller companies (2.2 vs. 1.5). Discounting the purely manufacturing initiatives CIM and FMS, the difference in use between manufacturers and non-manufacturers reduced to 2.06 initiatives vs. 1.32 initiatives.

INSERT TABLE 5 HERE

Forty-seven respondents, 23 percent, reported that they were significant users of ABC. Another 18 respondents indicated that they were implementing ABC, but that the system was not yet in significant use. This rate is somewhat lower than prior research (Shim and Stagliano 1997; Geishecker 1996), which reported that 27 to 44 percent of respondents were using ABC.^{xi} Manufacturers reported higher use than non-manufacturers (31.1 percent vs. 14.3 percent). Significant ABC users generally also used other initiatives (mean of 2.2 other initiatives). Only seven of 47 ABC firms were using ABC in isolation.

As reported in Table 6, significant users tended to use ABC in several applications, with, as expected, cost reduction and product costing representing the highest uses (4.37 and 4.13 out of 5, respectively). The majority, 34, had been using ABC for over two years. 72 percent felt that the implementation had been successful, 66 percent felt that ABC had been worth implementing, and 64 percent felt that benefits exceeded costs. The correlation of SUCCESS with BENEFIT is 0.60, statistically significant and consistent with that found by Shields (1995) of 0.53.

INSERT TABLE 6 HERE

The correlation matrix portraying the univariate relationships between new business initiatives is presented as Table 7. For the full sample, thirty-nine percent of the relationships are significant at the $\alpha=0.05$ level, and all significant relationships are positive except that of Business Process Reengineering (BPR) and the Theory of Constraints (TOC). JIT exhibits the strongest relationship with other initiatives, with significant correlations between it and all other relationships except TOC. ABC is significantly correlated with JIT at the $\alpha=0.05$ level, and BPR at $\alpha=0.10$. Somewhat surprisingly, the relationships are qualitatively similar for the partition including manufacturing firms only.

INSERT TABLE 7 HERE

Content Validity and Reliability

Confirmatory factor analysis is used to test the *unidimensionality* of each of the six multi-item constructs FUNCTION, APPLIC, EVAL, INFO, COMPLEX, and IMPORT.^{xii} One indicator of fit is the *chi-square* statistic (χ^2). A good fitting model may be indicated when the ratio of χ^2 to the degrees of freedom is less than two (Tabachnick and Fidell 1996). However, this statistic is sensitive to sample size and violations of assumptions of multivariate normality (Bentler 1983; Joreskog and Sorbom 1989), which can lead to rejections of the model even when the fit is reasonable. Therefore, it is useful to supplement the χ^2 with other indicators of fit. A *goodness of fit index (GFI)* of 0.90 or higher for the model suggests that there is no evidence of a lack of unidimensionality (Joreskog and Sorbom 1989), and an *adjusted goodness of fit index (AGFI)* of 0.80 and a *root-mean-square residual (RMR)* under 0.10 are generally regarded as indications of good fit (Libby and Tan 1994).

The χ^2 statistics, and GFI, AGFI, and RMR indices for the six constructs are reported in Table 8. After deletion of five of 37 survey items, χ^2 tests that the models fit the data are not

rejected ($p < .01$), except for the importance of costs variable (IMPORT). Furthermore, all GFI and AGFI values are above 0.90 and 0.80, respectively, indicating that there is no evidence of a lack of uni-dimensionality.

INSERT TABLE 8 HERE

A scale exhibits *discriminant validity* if its constituent items estimate only one construct (Bagozzi et al. 1991). Lack of discriminant validity usually results in an over-estimation of correlation among constructs. To test scales for discriminant validity a χ^2 difference test is used (Ahire et al. 1996). A set of confirmatory factor analyses is run on each multi-item pair of scales, first allowing for correlation between the two constructs and then fixing the correlation between the two scales at one. A statistical significant difference in χ^2 statistics demonstrates that the two constructs under consideration are distinct (Venkatraman 1989).

For the six multi-item scales in the instrument, a total of fifteen discriminant validity checks were run. The three ABC scales (FUNCTION, APPLIC AND EVAL) failed to yield statistically significant χ^2 differences (the χ^2 difference is under two). Therefore, after confirming unidimensionality, the nineteen variables from those constructs were combined into a single construct for testing.

An NFI value of 0.90 or above demonstrates strong *convergent validity* (Tabachnick and Fidell 1996). The NFI values for all of the constructs are reported in Table 8. All of the scales had values over 0.90, demonstrating strong convergent validity.

Reliability refers to the degree of dependability, consistency, or stability of a scale (Gatewood and Field 1990). Cronbach's coefficient alpha (α) is a widely used measure of scale reliability (Cronbach 1951). In exploratory research an alpha above 0.50 is considered

satisfactory (Nunnally 1978). The Cronbach's alpha values for each construct are shown in Table 8. All scales have acceptable reliability.

Preliminary Test of Efficacy

Prior to formal hypothesis testing a rough approximation of the primary model is tested. This (regression) model does not include the refinements and advantages obtained from use of structural equation modeling (as specified in Figure 1). However, it does yield information regarding the overall efficacy of the enablers that is not obtained with the LISREL model.

A construct composed of the two ROI variables is regressed against constructs for ABC use, other initiative use, size, a composite construct composed of the six enablers, and an interaction variable (composed of ABC, other initiative use, and enablers). Survey items are weighted equally within constructs and constructs are weighted equally within composite constructs. The regression model is:

$$\Delta ROI = \alpha + \beta_1 ABC + \beta_2 INIT + \beta_3 ENABLE + \beta_4 ABC * INIT * ENABLE + \beta_5 SIZE$$

Where		Expected <u>Sign</u>
ΔROI	= the average of five-point measures of industry-adjusted improvement of ROI over three and five years	+
ABC	= the average of 19 five-point Likert measures of ABC use	+
INIT	= the sum of eight binary measure of significant initiative use	+
ENABLE	= the average of six measures of enabling variables which in turn are composed of the average of individual survey items	?
ABC*INIT*ENABLE	= an interaction term	+
SIZE	= the log of the mid-point of a five-point Likert sales category	?

The results of this regression are presented as Table 9. Use of other initiatives is significant at the $\alpha = 0.05$ level, and the interactive term is significant at 0.081. There appears to

be an overall effect of enabling variables and use of initiatives combined with ABC. It is noteworthy that this effect is not present when ABC is dropped from the interaction term. The contrast between effects with and without inclusion of ABC is an indicator of probable efficacy of the use of ABC under favorable enabling conditions.

INSERT TABLE 9 HERE

Hypothesis Testing

The purpose of the first two hypotheses is to test whether ABC is directly associated with improvement in ROI (H1) and to identify the enabling conditions under which ABC results in an improvement ROI (H2). To perform these tests, the conceptual model presented previously as Figure 1 is modified to that shown in Figure 3. Figure 3 also reports the results of testing.^{xiii} Product terms are created for the interactions between each of the enabling variables, other initiatives, size, and ABC. Positive significance of the ABC variable would indicate a direct effect on change in performance, regardless of environmental conditions. Positive significance of a product term indicates that ABC is positively associated with an improvement in performance when used in the environment described by the product term.^{xiv}

INSERT FIGURE 3 HERE

The fit of the model is good: χ^2 (1017df) = 911, $p < 0.99$, GFI = 0.96, AGFI = 0.92, RMR = 0.075. Many of the variables have significant direct effects: INFORMATION technology, IMPORTance of costs, SIZE, and other INITIatives have positive direct effects at the 0.05 level. Number of INTRA-company transactions and COMPetitive environment have negative direct effects at the 0.05 level. COMPLEXity (positive) and unused CAPACity (negative) are not significant at conventional levels. The effect of ABC, although positive, is not significant ($p < .3483$). This means that there is no direct affect associated with use of ABC. H1 is not rejected.

More importantly, however, the interactions of ABC with COMPLEXity ($p < .012$) and other INITiatives ($p < .030$) are positive and significant which means that H2 is confirmed for those conditions. The interactions of ABC with IMPORTance of costs, INTRA-company transactions, and SIZE are significant at 0.10 ($p < 0.097$, $p < 0.079$, and $p < 0.093$, respectively). The signs of the other enabling variable interactions are as expected, although not significant. It is very possible that use of a larger sample size would have increased statistical power sufficiently to result in significance. Also, results for ABC*CAPAC (unused capacity) may be weakened because survey responses indicated that non-manufacturers had difficulty assessing their capacity utilization.

The results of the three tests of H3 are presented in Table 10. As expected with use of single item variables of interest, model fit is not as good as that of the previous model. χ^2 generally approaches three times degrees of freedom rather than the desired two. GFIs range in the lower 0.80s and AGFIs in the upper 0.70s, although the RMR for all three models are under 0.08. Variable significance is consistent for the three models. INFORMATION technology, IMPORTance of costs (except against SATISFACTION), and other INITiatives are positive and significant at 0.05. INTRA-company transactions and COMPetitive environment are negative and significant. SATISFACTION ($p < .104$), SUCCESS ($p < .059$), and financial BENEFIT ($p < 0.174$) are positively signed and SUCCESS is marginally significant. Although no firm statistical conclusions can be reached regarding H3, it appears that the variables are relatively good proxies for improvement in performance associated with use of ABC.

INSERT TABLE 10 HERE

Sensitivity Analysis

As additional checks on the specifications of the models, the analysis was re-estimated with 1) limited, and 2) substantial error correlation allowed between the independent manifest variables, 3) restriction of the error correlation of the dependent variables, 4) change in ROI over separate three and five year periods rather than a construct derived from the combination of the two periods, 5) all correlations between the latent constructs allowed rather than only those statistically significant at the 0.10 level, 6) a direct effect of industry TYPE on change in ROI (even though the ROI variable is industry-adjusted), 7) a reduction in the number of manifest ABC variables from 19 to six (H1 and H2 model only), and 8) for the preceding exploratory regression analysis, change in ROI measured over separate three and five year periods. Although there is some change in fit statistics of the models, there is little change in significance levels of the independent variables, with the following exceptions.

When correlated errors of the manifest independent variables are estimated, t-statistics of all variables tend to increase. If a large number of correlations are estimated, the interaction terms and the SUCCESS and SATISFACTION variables become significant at $\alpha = 0.05$. However, in the absence of an error theory to explain these correlations, no inference can be made from these results.

Since correlated errors were expected for the dependent variables ROI3 and ROI5, the results have been reported with correlated error terms. When the errors between ROI3 and ROI5 are not allowed to correlate, significance levels of the independent variables are generally weakened somewhat. Although signs remain as expected, ABC* IMPORTance of costs and ABC*SIZE lose their significance ($p < 0.176$ and $p < 0.142$ vs. $p < 0.097$ and $p < 0.093$). ABC*INIT also loses some significance ($p < 0.054$ vs. $p < 0.030$). However, even with this

additional restriction, the models furnish evidence of the efficacy of ABC under specific environmental conditions.

Remaining sensitivity tests yielded little additional information. TYPE is never significant at conventional levels and modification to the permitted correlations of the latent construct matrix had minimal effect. For the three-year change in ROI model, IMPORTance of costs becomes significant at the 0.05 level when SATISFCATION is the dependent variable (rather than the $p < 0.097$ for the reported model).

SUMMARY & DISCUSSION

This paper investigated the improvement in financial performance that is associated with ABC use and the enabling conditions, including concurrent use with other initiatives, under which benefits are obtained. Information regarding initiative use was collected from a sample of 204 firm business units. Confirmatory factor analysis and structural equation modeling (SEM) were used to test a model hypothesizing the conditions under which there is a positive association between a composite measure of the use of ABC and change in financial performance. Control was provided for the moderating effects of concurrent use of other initiatives and enabling conditions derived from prior research.

The first finding was that positive synergies are obtained from concurrent use of initiatives with ABC. This finding is consistent with statements by researchers that management accounting systems are meant to be efficient in supporting firms' operational effectiveness (Granlund and Lukka 1998; Cooper 1996; Porter 1996; Granlund 1997). A primary purpose of initiatives is to improve this effectiveness and ABC is contributing in this regard. However, more research is needed to explain how this effect occurs. Research that identifies the components of financial performance that are impacted by initiative use would be of benefit.

The second finding provided evidence supporting previous analytical and theoretical research regarding the conditions favorable to obtaining benefits from ABC. There is a positive association between ABC and improvement in ROI when implemented in complex and diverse firms, in environments where costs are relatively important, and when there are limited numbers of intra-company transactions to constrain benefits. These positive findings regarding ABC are of particular interest to practicing and academic accountants because they are often the primary proponents and administrators of ABC.

There is some indication that other enabling conditions (information technology sophistication, absence of excess capacity, and a competitive environment) affect the efficacy of ABC. The signs of the coefficients of these non-significant enabling variables are as expected, leading one to suspect that statistical power might have been an issue. Although it is difficult to obtain both large sample sizes and the volume of information necessary to adequately measure the constructs of interest, the subject is of significant importance to pursue. Further research is also required to explain the increased efficacy of ABC in smaller business units.

Finally, there was some evidence that previously used measures of ABC success, satisfaction with ABC, and financial benefit obtained from ABC (Shields 1995; Swenson 1995; Krumwiede 1996, 1998) are predictors of improvement in financial performance. This finding is an important step toward completing the link between identification of the conditions affecting the success of ABC implementation, to documentation of ABC's efficacy as a profit-enhancing tool.

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Endnotes

ⁱ The terms activity-based costing (ABC) and activity-based management (ABM) are sometimes used interchangeably. Strictly speaking, ABC refers only to determining the costs of activities and the outputs that those activities produce. Some researchers and practitioners prefer to use the term activity-based management (ABM) when describing how the activity information is used to support operating decisions. As in Swenson (1995), this study defines ABC broadly to include both activity-based costing and activity-based management.

ⁱⁱ A further indication of the theoretical acceptance of ABC comes from a 1996 survey by the Institute of Management Accountants (IMA) of companies that were upgrading their cost management systems. Some 49 percent of the companies surveyed were already using ABC-type systems (up from 41 percent from a similar survey in 1994). 54 percent of adopters were using ABC for decision-making. Of the remaining 59 percent of the 1994 respondents that were using some method other than ABC for their cost management practices, almost one-third felt that they should be using ABC (IMA 1994). The respondents were members of the IMA Cost Management Group, which largely consists of manufacturing companies.

ⁱⁱⁱ On the other hand, using archival data sources is not problem-free either. For example, there are significant discrepancies in financial data between the COMPUSTAT and Value Line databases (Kern and Morris 1994), and in SIC codes between CRSP and COMPUSTAT, limiting the ability to compute accurate industry mean-adjusted variables (Ong and Jensen 1994).

^{iv} Variances can occur for reasons other than lack of knowledge by the internal auditor. For example, choosing “4” (agree) vs. “5” (strongly agree) requires a value judgement that can vary between subjects. Also, subjects could be reporting their belief in “true” unobservable financial performance rather than reported financial performance.

^v $1/(\sigma\sqrt{2\pi}) \exp[-1/2\sigma^2 (x-\mu)^2]$ where x = number of years since beginning of use of an initiative, $\mu = 5$ years and $\sigma = 2$ years.

^{vi} As with other studies, because this research relies on self-reported data, it is potentially subject to reporting biases and measurement error called common-method bias (Johnson et al. 1995). However, Miller and Roth (1994) suggest that care in the selection of respondents can contribute to overcoming common-method bias. The selection of unbiased, objective and knowledgeable internal auditors is believed to eliminate most, if not all potential effects from common-method bias that may be present in other research.

^{vii} The IIA serves as the internal auditing profession’s authority on significant issues affecting internal auditors, and is the only organization dedicated solely to the advancement of the internal auditor and the profession on a worldwide basis. The IIA is the world’s leader in research and educational issues for internal auditors and is the standards-setting body for the profession. It has approximately 68,000 members in 230 local chapters, national institutes and audit clubs in more than 100 countries (IIA 1999a, 1999b).

^{viii} In six instances, there were multiple responses from the same business unit. Differences were minor, and responses were combined into a single observation by averaging scores.

^{ix} For effective analysis, the sample covariance matrix must be reasonably stable and approximate the pattern of covariances in the population. In general, *ceteris paribus*, the larger the sample size the more likely this will be the case. Guadagnoli and Velicer (1988) reviewed the literature on sample size considerations in factor analysis and principal components analysis and conducted an extensive Monte Carlo study on sample size effects. Consistent with other Monte Carlo studies, they found no support for often used rules of thumb based on respondents-to-variables criteria (e.g., 5:1). As quoted from Jaccard and Wan (1996):

“The most important factors influencing the stability of the sample covariance matrix were the absolute sample size and the magnitudes of the path coefficients from the latent constructs to the observed indicators (referred to as “saturation”). When such standardized path coefficients were low (i.e., near 0.40), sample size was quite important. At moderate to high saturation levels (e.g., standardized path coefficients of 0.60 to 0.80), once a certain sample size was achieved, further

improvements in stability were small with increasing N. When saturation was high (standardized path coefficients of .80), sample sizes as low as 50 performed well, even when the number of variables in the covariance matrix was large.”

Jaccard and Wan then recommend a sample size of 75-100 in conditions of high saturation, and 150 for moderate saturation levels. The saturation levels obtained in this study are “high” for 76 percent of the multi-item variables used to test H1 and H2 and “moderate” to “high” or “high” for 80 percent of those used to test H3. These levels are adequate to expect a stable covariance matrix.

As a check, a sensitivity test is performed whereby the 19 ABC manifest variables are reduced to six, reducing the number of manifest variables to 25 and increasing the sample size/variable ratio to 8:1 from 5:1. Results are not impacted.

^x As recommended by Young (1996), procedures prescribed by Dillman (1978) for maximizing response rates were followed. Specific steps taken included 1) sending a second mailing, 2) promising confidentiality of responses, 3) including deadline dates for reply, 4) including personalized cover letters, 5) including a postage-paid, self-addressed envelope for reply, and 6) promising to send a summary of results on request.

^{xi} Prior research has generally used samples from populations that consisted of manufacturers exclusively. This is a likely explanation for the lower use of ABC found in this study.

^{xii} To use confirmatory factor analysis for verifying unidimensionality, a measurement model is specified for each construct. Individual items constituting the construct are examined to see how closely they represent the same construct.

^{xiii} Factor loadings and structural coefficients are obtained using the maximum likelihood estimation method. Estimation involves finding the values of the coefficients that produce an estimated covariance matrix that is as close as possible to the sample covariance structure of the manifest variables (Libby and Tan 1994).

^{xiv} A potential problem with this approach is that the measurement error for a given product indicator must be a function of the measurement error of the component parts of the product terms (Jaccard and Wan 1996). Joreskog and Yang (1996) developed an approach to address this problem, which requires the formation of four new matrices and the imposition of nine constraints per product term. The resulting model requires estimation of a number of parameters that is larger than the sample size, resulting in unstable parameters. However, the parameters and t-statistics derived are nearly identical to those previously reported. All variables retain their signs and significance levels are stable within 0.05 and 0.10 boundaries.