

## **AN EMPIRICAL ANALYSIS OF ABI ACCEPTANCE MEASURES AND DETERMINANTS**

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### **ABSTRACT**

Contrary to many, this study contends that activity-based costing (ABC) success ultimately depends on user acceptance of activity-based information (ABI) in the early stages of the ABC system implementation. The results of this study reveal that the level of effort required to use ABI will have a significant influence on user acceptance of ABI. The findings also suggest that the expected benefits of using ABI, use of ABI, and satisfaction with ABI are related to the complexity of the users' task activities and level of involvement in the ABC system design.

### **INTRODUCTION**

Activity-based costing (ABC) systems have become very popular for providing improved cost data for products and services. However, in recent years both practitioners and researchers are increasingly evaluating whether activity based management (ABCM) is effective as a cost management strategy.<sup>1</sup> This recent skepticism is attributed to the growing evidence that many organizations are achieving performance gains from their ABC systems while others are not (Johnson, 1992; Shields, 1995; Gosselin, 1997).

While many prior ABC studies focused primarily on issues related to the ABC system and its implementation, in general, little information is available on the behavioral effects of ABI and user environment on ABC acceptance. The aim of this study is to further understand the individual-level factors that may influence the effective use of ABI, the latter resulting in sub-optimal decision-making and an unsuccessful ABC endeavor. This study differs from many related ABC implementation and success research in that it focuses on the effects of task complexity, user involvement in the ABC system design, adequacy of ABI training received, and the level of effort required to use ABI on user acceptance of the information (perceived usefulness, user satisfaction and ABI use) in the early stages of the ABC system implementation. It is plausible that user rejection (i.e., dissatisfaction with or lack of use) of ABI may create major challenges for the organizations, such that the success of the ABC endeavor is impeded. Since organizations expend considerable resources to implement and maintain ABC systems, insight about factors that may hinder employees from effectively using or relying on ABI in performing their job task should be of great importance to practitioners.

The premise of this study is that managing operations and performance using ABI is by nature a complex process that involves the use of accurate and reliable information to cope with the

increasing complexity in companies' operating environment. Accordingly, in this paper, user acceptance of ABI is considered the foremost antecedent of success of an ABC system. This study explores task complexity, ease of using the ABI, user involvement in the ABC system design, and the adequacy of training as determinants of user acceptance of ABI. Univariate results of one-way analysis of variances (ANOVA) and regression techniques are utilized to analyze Web survey data collected from employees at various levels throughout a large Canadian telecommunication firm that has recently implemented ABC and is working towards full integration.

## **LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT**

Activity-based costing management is a continuous management philosophy that involves the use of an ABC system, a multi-functional management information tool, to provide ABI to cope with the increasing complexity in companies' operating environment. Interestingly, many ABC systems are actually implemented and to some extent used, but many not be considered successful because there is no action taken on the information provided (e.g., elimination of non-valued-added activities) or improved decision-making performance (e.g., product costing and pricing). It is probable that the uniqueness of the information provided by the ABC system (e.g., costs are accumulated based on activities which can be voluminous and span across functional areas) will have an impact on the extent to which users will accept ABI, process the information and believe that it is unreliable or irrelevant for decision-making.

The results of several ABC studies examining organizational members' acceptance of ABC systems report mixed results. For instance, Shields (1995), Swenson (1995), and McGowan and Klammer (1997) reported that relative to their traditional systems, managers are satisfied with the results produced by their ABC system. However, the results of the studies provide evidence that an increasing number of ABC adopters are experiencing problems getting their employees to take actions based on activity-based information (ABI) and in some cases, have abandoned their ABC initiatives (Weytens & Bruggeman, 1994; Player and Keys, 1995; Shields, 1995; Anderson and Young, 1999). We suggest that employees may reject ABI if they are facing complex job tasks and decisions, believe that the information is difficult to use, experiencing task overload and/or did not receive effective training on the selection and effective use of ABI.

### **Task Complexity**

Task complexity refers to the analyzability of the task and the extent to which the task can be performed by following formal or well-defined procedures or steps (i.e., availability of specific task knowledge). The complexity of work requirements has a significant influence on the degree of task structure (Galbraith, 1977), the information processing requirements and capacity, and task performance due to the demands it places on a person's knowledge, skills and resources (Wood, 1986). Task complexity has been found to be positively related to functional information search and use, system usage behaviors (Blili et al., 1998; Kim et al., 1998) and user perceptions and attitudes (Davis et al., 1989; Igarria, 1990; Thompson, 1994; Kim et al., 1998). The results of these studies suggest that individuals use and are more satisfied with system output if they believe that the information helps them cope with task complexity, increase task performance, and is reasonably easy to use (Gul & Chia, 1994; Chong, 1996).

Turney (1991) postulates that ABC systems are better suited to provide broad scope, yet task-specific information, than traditional costing systems. ABC systems facilitates "what if" analysis

and allows users to continuously restructure the data while exercising control over the type, aggregation level, and timeliness of the information. Therefore, individuals that have to make decisions in a highly uncertain complex environment may consider the diversity and amount of information provided in ABC reports useful in increasing information processing capacity (i.e., reducing uncertainty) and enhancing decision quality. These individuals may use ABI to a greater extent and be more satisfied with the information. On the other hand, the use of broad scope yet detailed “standardized” and irrelevant ABI, in conditions where tasks and events are fairly difficult, may result in task overload, unfavorable perceptions, and possibly sub-optimal use of ABI and less satisfaction.

The use of ABI when task complexity is low, likewise, may create unfavorable user perceptions. For instance, low analyzable tasks require less precise, yet richer, information and information processing than simple and routine tasks (Ghani, 1992). When individuals are faced with more analyzable and routine task activities, the use of detailed “standardized” ABC reports may be viewed as irrelevant or redundant and interfere with their simple information needs. Detail information processing and the use of ABC reports may contribute to individuals wasting time and resources on relatively effortless tasks and decisions. As a result, individuals may have unfavorable perceptions and attitudes regarding the usefulness of ABI.

- H1a:** Users’ perception regarding the usefulness of ABI is negatively associated with the complexity of their job-related tasks.
- H1b:** ABI usage is negatively associated with the complexity of job-related tasks.
- H1c:** Users’ satisfaction with ABI is negatively associated with the complexity of their job-related tasks.

## **Ease of Use**

Ease of use refers to the degree to which an individual believes that using a system and its output is effortless. Self-efficacy theory suggests that perceived ease of use is one of the basic determinants of information system use behaviors and perceived usefulness (Davis et al., 1989; Adams et al., 1992; Davis, 1993; Igarria et al., 1997). The results of numerous empirical studies support the importance of perceived ease of use and its association with perceived usefulness and technology acceptance (Chau, 1996; Igarria et al., 1997).

With regards to ABC systems, Turney (1991) maintain that the systems produce readily accessible information that is fairly ease to use. However, Waeytens and Bruggeman (1994) found that some employees felt that the ABI was too complex and ambiguous for product costing and managerial functions. The challenge of system designers is to develop functional capabilities and output formats that are easy to use while providing relevant information that is reasonably effortless to comprehend. A system that does not enable workers perform their jobs effortlessly is not likely to be received favorably even when the implementation has been handled carefully. If this philosophy holds, then users who believe that using ABI requires less effort are more likely to use the information. Based on the above discussion, it is anticipated that individuals are more likely to use and have favorable opinions of ABI to the extent that the information is fairly easy to use.

- H2a:** Users’ perception regarding the usefulness of ABI is positively associated with the ease of using ABI.
- H2b:** ABI usage is positively associated with the ease of using ABI.

**H2c:** Users' satisfaction with ABI is positively associated with the ease of using ABI.

### **User Involvement**

Employee participation in the development of a new computer information system is a critical factor in user acceptance of the system (Olson & Ives, 1981; Lucas et al., 1990; Guimaraes et al., 1992). Prior literature suggests that user involvement has a positive effect on system success by providing increased knowledge about the targeted user groups and a more reliable assessment of their informational needs. User participation also facilitates system ownership, user acceptance, and understanding of the system (Lucas, 1975). User involvement has also been linked to ABC implementation outcome (McGowan & Klammer, 1997; Krumwiede, 1998). They suggest that user involvement in the ABC implementation may reduce unrealistic expectations and resistance to the change. We expect that when relevant information, obtained from individuals most knowledgeable, is included in the design of the ABC system, employees are more likely to have positive attitudes towards its usefulness and may also lead to the development of a system that is easier to understand and use.

Franz and Robey (1986), however, suggest that it is plausible that despite user involvement in the system development, the actual system may not fit users' needs or expectations and create unfavorable perceptions of ABI. For instance, if employees' involvement in the implementation is limited to mere inclusion or representation in the implementation meetings, but their suggestions and comments are not considered. When employees only provide input regarding their information needs, but are not involved in the design aspects of the ABC system, they may have unfavorable perceptions of the ease of using the information. As such, employees may feel that ABI is not useful in performing task and decision-making activities.

- H3a:** Users' perception regarding the usefulness of ABI is positively associated with their involvement in the ABC system design.
- H3b:** ABI usage is positively associated with their involvement in the ABC system design.
- H3c:** Users' satisfaction with ABI is positively associated with their involvement in the ABC system design.

### **User Training**

The results of numerous Management Information System (MIS) research studies suggest that there is significant and positive relationship between the adequacy of user training received and system success (Saunders & Courtney, 1985; Raymond, 1990; Guimaraes et al., 1992; Igbaria et al., 1997). Adequate user training has also been linked to ABC implementation outcome (Foster & Swenson, 1997; McGowan & Klammer, 1997; Krumwiede, 1998). The level of personal computing training provided is critical to the acceptance of most technological innovations in organizations (Raymond, 1990). Because individuals differ in their cognitive structure, decision-making style, and job responsibilities, their level and type of training requirements will also vary. Therefore, the nature of the training may also influence the acceptance of a technological innovation. Shields (1995) contend that user training is a mechanism to enable employees to understand the ABC philosophy and its benefits, effectively use ABI, reduce system and change apprehension, and foster non-accounting system ownership. The following hypotheses will be tested to evaluate the relationship between user acceptance of ABI and contextual factors:

- H4a:** Users' perception regarding the usefulness of ABI is positively associated with the adequacy of ABI training received.
- H4b:** ABI usage is positively associated with the adequacy of ABI training received.
- H4c:** Users' satisfaction with ABI is positively associated with the adequacy of ABI training received.

In addition, the following "fit" hypotheses relate to the motivation that the level of task complexity as well as the adequacy of the ABI training received will affect an individual's information needs, perceptions of information sources, intentions, and behaviors.

- H5:** Perceptions and acceptance of ABI will be more favorable for individuals facing highly complex tasks activities than for individuals facing lower complex task activities.
- H6:** Users perceptions and acceptance of ABI will differ significantly across the adequacy of the ABI training received.

## **METHODOLOGY**

The company (hereinafter referred to as the "company") is a major Canadian provider of telecommunications services, including voice, data and video, wireless, and Internet access to a broad global customer base. The company participating in the study was selected based on the criteria that it had completed an ABC system implementation within the last five years. The top-down implementation of ABC began in 1995 as a company-wide initiative. With assistance from external consultants, the company has developed and implemented proprietary ABC software. After approximately one year, the company completed its initial ABC model and began using ABI in 1996.<sup>2</sup> In regards to training, a one-day ABC education and awareness course was held during the implementation phase. Periodic training sessions and technical assistance is provided on an as needed basis.

The finance unit has ownership of the ABC system. The ABC system is used along with the traditional cost management system to provide "richer company-wide data to facilitate cost management and profitability assessment while providing more detailed data for specific areas (e.g., billing). Specifically, the system pulls all cost data from the company's accounting system. Costs are then traced to work activities that are causally linked to the applicable processes or cost objects. The system is comprised of two primary models: (1) activity and (2) cost and product. These models include very detailed cost categories (for each activity and cost object combination) with over 350 activities, 2 levels of cost drivers, 60 products, and 20 markets. The activity model (i.e., cost and activity process reporting) is updated monthly, whereas the cost and product model (i.e., profitability data by product and market) is updated quarterly. The ABC system is integrated with an on-line analytical processing tool that permits full web-based functionality, integration, and multiple hierarchies. Users are able to simultaneously share, retrieve, analyze and summarize the ABI cost and profitability data in multiple dimensions and perform "what if" analyses. Quarterly profitability reports are also produced using ABI.

At the time of data collection, ABI was being used to facilitate strategic decision-making (including activity based budgeting) and customer billing across the company. Senior corporate personnel, unit managers and operating managers/supervisors were being encouraged to utilize ABI to support process improvement, cost analysis, cost reduction and profitability assessment and other operational decisions (not the initial objective). The areas that use ABI most frequently

are corporate finance and marketing areas. Employees and managers in operations, customer service, and quality control also make frequent use of ABI.

## **Data Collection**

All company employees listed on the company's ABC system access database were asked by the company's ABC Director to participate in the Internet survey. Individuals from various functional areas and at various employment levels were asked to complete the web survey.<sup>3</sup> A total of 70 out of 169 potential ABI users completed the web survey, resulting in a response rate of 41 percent.<sup>4</sup> Approximately half (47.1%) of the respondents reported that they were upper or middle management and upper-level supervisors; approximately 34.3 percent are analysts and lower-level supervisors. Although approximately 44.3 percent of respondents indicated they have between 16 and 25 years of work-related experience (average = 18 years), 70.1 percent of respondents reported being employed in their current positions for five years or less. Approximately 84.3 percent of respondents are employed in four functional areas: corporate finance (15.7%), operations finance (24.3%), operations and product management (30%), and marketing (14.3%). In terms of the highest level of education obtained, approximately 64.3 percent of respondents have either a college diploma or university bachelor's degree, while 11.4 percent have a master's degree.

## **Measurement and Psychometric Assessment of Variables**

ABI acceptance is operationalized using three widely used and related (self-reported) surrogates of technology acceptance: perceived usefulness (Igarria et al., 1997), use (Doll & Torkzadeh, 1989; McGowan, 1997), and user satisfaction (McGowan, 1997). The score of each research variable is obtained by forming a composite measurement scale using the average of all the survey items with a principal component loading greater than 0.50 (i.e., unidimensionality) on the variable (Hair et al., 1998). The convergent validity (reliability) of the variables is assessed using Cronbach's alpha and a composite reliability (CR) index. A Cronbach's alpha coefficient greater than 0.60 and a CR index greater than 0.80 are the recommended minimum levels for evidence of convergent validity (Hair et al., 1998).

Task complexity is measured using Sander and Courtney's (1985) modified version of Van De Ven and Ferry's (1980) organizational assessment instrument. Respondents are asked to respond to three questions describing the level of complexity of their task activities relating to the extent of problems encountered and time spent solving problems.<sup>5</sup> The results of the PCA revealed that all items loaded on to a single factor (eigenvalue = 1.46, variance explained = 48.73%). Ease of use refers to the extent to which users perceive ABI as relatively easy to comprehend and use when performing decision-making and task activities. The six items used to measure the perceived ease of use variable were adapted from Davis (1993). The results of the PCA revealed that all items loaded on to a single factor (eigenvalue = 3.62, variance explained = 60.39%).

User involvement is measured using a modified version of Franz and Robey's (1986) user involvement scale. Respondents were asked to respond to five statements concerning their perceived influence and degree of involvement in the ABC system design. The PCA resulted in the extraction of only one component with an eigenvalue greater than one representing user involvement (eigenvalue = 3.77, variance explained = 75.36%). ABI training is operationalized based on the respondents' subjective assessment of the adequacy of the training received on selecting and using ABI and their level of preparedness for using ABI. The results of the PCA

revealed that all items loaded on to a single factor (eigenvalue = 3.33, variance explained = 66.59%).

Perceived usefulness refers to the degree to which individuals believe that using ABI will provide relevant information to enable them to improve their task performance and/or enhance job satisfaction (Davis, 1993). Users' perceptions of the usefulness of the ABI with respect to his or her job activities are measured using six items adapted from Davis (1993). The results of the PCA revealed that all items loaded on to a single factor (eigenvalue = 4.71, variance explained = 78.46%). The four items used to measure ABI use were adapted from Rahman and McCosh (1976) and asked respondents to indicate the extent of their use of ABI. A self-reported measure is a relative indicator of actual ABI use and is considered appropriate (Davis, 1993; Igbaria et al., 1997). The results of the PCA revealed that all items loaded on to a single factor (eigenvalue = 2.16, variance explained = 53.89%). User satisfaction with ABI is operationalized using ten questions adapted from Doll and Torkzadeh's (1989) measure of end-user computing satisfaction. The items ask respondents to indicate the extent of their satisfaction with ABI along four dimensions: information content, system accuracy, report format, and timeliness. The results of the PCA revealed that all items loaded onto a single factor (eigenvalue = 6.18, variance explained = 61.83%).<sup>6</sup>

Review of the Cronbach's alpha and composite reliability for all of the variables support the satisfactory internal reliability of each of the measurement scales, except for task complexity. The Cronbach's alpha and composite reliability of all the variables are above the suggested minimum level for evidence of reliability. With respect to task complexity, the Cronbach's alpha of 0.51 and composite reliability of 0.737 are below the suggested minimum level for evidence of reliability but are not sufficiently low to threaten the convergent validity of the variable. Finally, the correlation coefficients, presented in Table I, Panel B, provide evidence of the discriminant validity of the variables. The variables used to measure a dimension have higher intercorrelations as compared to their correlation with items measuring other dimensions (Fornell et al., 1982).

## RESULTS

The descriptive statistics reported in Table 1, Panel A indicated that ABI users' tasks, on average, are characterized by a moderate degree of complexity (mean = 2.63). The mean for perceived ease of use of 2.95, respectively, indicate that, overall, ABI users' have somewhat neutral opinions about the level of effort required to use ABI in performing task-related activities. With regards to characteristics of the implementation process, the mean scores suggest that, overall, ABI users had little involvement in the design of the ABC system (e.g., information needs, input/output requirements) (mean = 1.66) and rate the training received and their preparedness for using ABI as less than adequate (mean = 2.30). The means for perceived usefulness (2.81), ABI use (2.19) and user satisfaction (2.69), indicate that, overall, the sampled ABI users have somewhat neutral opinions about the usefulness of ABI in performing task-related activities; do not extensively use ABI; and are generally less often satisfied with the information content, system accuracy, report format and timeliness of ABI.

Pearson correlation coefficients for the research variables are provided in Table I, Panel B. As expected, the measures of user acceptance of ABI are significantly correlated with each other. The perceived usefulness of ABI is significantly and positively related to both ABI use ( $r = 0.62$ ,  $p < 0.01$ ) and user satisfaction ( $r = 0.53$ ,  $p < 0.01$ ). User satisfaction with ABI is also positively

related to the use of the information ( $r = 0.75, p < 0.01$ ). The correlation analysis, as expected, reveal that user acceptance of ABI is significantly positively related to contextual factors. For instance, perceived usefulness of ABI is negatively related to task complexity ( $r = -0.24, p < 0.05$ ) and positively related to perceived ease of use ( $r = 0.41, p < 0.01$ ). The use of ABI is also negatively related to task complexity ( $r = -0.19, p < 0.10$ ), positively related to perceived ease of use ( $r = 0.33, p < 0.01$ ), user involvement ( $r = 0.29, p < 0.01$ ) and the adequacy of ABI training received ( $r = 0.26, p < 0.05$ ). While user satisfaction with ABI is negatively related to task complexity ( $r = -0.31, p < 0.01$ ), it is positively related to perceived ease of use ( $r = 0.37, p < 0.01$ ) and the adequacy of ABI training received ( $r = 0.34, p < 0.01$ ).

### Hypotheses (H1-H4) Testing

To test the specified hypotheses (H1 –H4), a series of multiple regression analysis was run using the three measures of ABI acceptance (perceived usefulness, ABI use and user satisfaction) as dependent variables. The overall model is as follows:

$$X_5 \text{ (ABI Acceptance)} = \alpha_0 + B_1X_1 \text{ (Task Complexity)} + B_2X_2 \text{ (Perceived Ease of Use)} + B_3X_3 \text{ (User Involvement)} + B_4X_4 \text{ (ABI Training)} + \varepsilon$$

**TABLE I**  
**Correlation and Descriptive Statistics**  
**(n = 70)**

#### Panel A: Descriptive Statistics

| Variable                                 | Minimum | Maximum | Mean | Standard Deviation |
|--|---------|---------|------|--------------------|
| Task Complexity (TC) <sup>1</sup>        | 1.33    | 5.00    | 2.63 | 0.86               |
| Perceived Ease of Use (PEU) <sup>2</sup> | 1.17    | 4.50    | 2.95 | 0.79               |
| User Involvement (INV) <sup>3</sup>      | 1.00    | 4.60    | 1.66 | 0.97               |
| User Training (TRN) <sup>4</sup>         | 1.00    | 4.20    | 2.30 | 1.02               |
| Perceived Usefulness (PUF) <sup>5</sup>  | 1.00    | 4.83    | 2.81 | 1.02               |
| ABI Use (USE) <sup>6</sup>               | 1.00    | 3.50    | 2.19 | 0.74               |
| User Satisfaction (SAT) <sup>7</sup>     | 1.00    | 4.10    | 2.69 | 0.95               |

#### Panel B: Correlation Matrix (Pearson Coefficients)

|                  | TC       | PEU     | INV     | TRN     | PUF     | USE     | SAT  |
|------------------|----------|---------|---------|---------|---------|---------|------|
| TC <sup>1</sup>  | 1.00     |         |         |         |         |         |      |
| PEU <sup>2</sup> | -0.32*** | 1.00    |         |         |         |         |      |
| INV <sup>3</sup> | 0.34***  | -0.04   | 1.00    |         |         |         |      |
| TRN <sup>4</sup> | -0.16    | 0.51*** | 0.10    | 1.00    |         |         |      |
| PUF <sup>5</sup> | -0.24**  | 0.41*** | 0.04    | 0.07    | 1.00    |         |      |
| USE <sup>6</sup> | -0.19*   | 0.33*** | 0.29*** | 0.26**  | 0.62*** | 1.00    |      |
| SAT <sup>7</sup> | -0.31*** | 0.37*** | 0.13    | 0.34*** | 0.53*** | 0.75*** | 1.00 |

\*, \*\*, \*\*\* Correlation is significant at 0.10, 0.05 and 0.01 level (1-tailed).

<sup>1</sup> 5-point scale ranging from 1 = low complexity to 5 = high complexity.

<sup>2</sup> 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree.

<sup>3</sup> 5-point scale ranging from 1=not at all to 5 = very much.

<sup>4</sup> 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree used to measure TRN1, TRN2, TRN3. The scale for TRN4 and TRN5 ranges from 1 = no training/unprepared to 5 = adequate training/preparation.

<sup>5</sup> 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree.

<sup>6</sup> 5-point scale ranging from 1 = no/low use to 5 = high use.

<sup>7</sup> 5-point scale ranging from 1 = almost never to 5 = almost always.

The results of the regression analysis are presented in Table II. The tolerance and variance inflation factor (VIF) and the intercorrelations suggest that multicollinearity is not a major problem for the estimation of the regression coefficients. The intercorrelations among the contextual (independent) variables are not significantly high. Task complexity is significantly and negatively correlated with perceived ease of use ( $r = -0.32, p < 0.01$ ) yet positively correlated with user involvement ( $r = 0.34, p < 0.01$ ). Perceived ease of use is significantly positively related to user training ( $r = 0.51, p < 0.01$ ). Examination of the studentized residual (plotted against the predicted values) and partial regression plots suggest that heteroskedasticity and normality are not major problems for the estimation of the regression coefficients. The contextual variables specified in the regression models explain 47 percent (adjusted  $R = 0.221$ ) of the variance in perceived usefulness ( $F = 4.614, p = 0.002$ ); 48 percent (adjusted  $R = 0.235$ ) of the variance in ABI use ( $F = 4.982, p = 0.001$ ); and 47 percent (adjusted  $R = 0.224$ ) of the variance in user satisfaction ( $F = 4.685, p = 0.002$ ), respectively.

The regression coefficients reported in Table II provide support for several determinants of ABI acceptance. The complexity of users job-related tasks is not significantly linked (although the coefficient is negative) to the perceived usefulness of ABI (H1a;  $B = -0.20, p = 0.194$ ). However, as hypothesized in H1b and H1c, task complexity is significantly and negatively linked with reported ABI usage ( $B = -0.20, p = 0.089$ ) and user satisfaction with ABI ( $B = -0.28, p = 0.049$ ). The results support the hypotheses that the ease of using and comprehending ABI is positively and significantly related to favorable perceptions regarding the usefulness of ABI (H2a;  $B = 0.60, p = 0.001$ ); use of ABI (H2b;  $B = 0.24, p = 0.054$ ); and user satisfaction with ABI (H2c;  $B = 0.26, p = 0.095$ ). Although the results do not support the hypothesis that user involvement in the ABC system design will promote favorable perceptions regarding the usefulness of ABI (H3a;  $B = 0.14, p = 0.252$ ), the results do provide support for the hypotheses that user involvement is positively and significantly related to use of ABI (H3b;  $B = 0.28, p = 0.003$ ) and user satisfaction with ABI (H3c;  $B = 0.20, p = 0.089$ ). Finally, the results indicate that the adequacy of ABI training received is not significantly linked to the three ABI acceptance measures; therefore, H4a, H4b, and H4c are not supported.

### **Fit Hypotheses (H5 and H6)**

ABI users' tasks, on average, are characterized by a moderate degree of complexity, as predicted. However, the one-way analysis of variances results presented in Table III reveal significant differences in users' perceptions of ABI, involvement in the ABC system design, and satisfaction with ABI, contrasted by whether they face highly complex or low complex tasks and decision-making activities.<sup>7</sup> ABI users facing less complex tasks and decision-making activities (mean = 3.36) perceive ABI as being easier to use than users facing more complex task and decision-making activities (mean = 2.60) ( $t = 4.08, p = 0.00$ ).<sup>8</sup> User involvement in the ABC implementation, in general, was significantly greater for users facing highly complex tasks and decisions (mean = 1.92) than users facing less complex tasks and decisions (mean = 1.38) ( $t = 2.122, p = 0.03$ ). With regards to acceptance of ABI, users facing less complex tasks perceived ABI as being more useful in performing task related activities (means = 3.08) than users facing more complex tasks (means = 2.62) ( $t = 1.77, p = 0.08$ ). Also, on average, users facing less task complexity (mean = 3.09) are significantly more satisfied with ABI ( $t = 2.43, p = 0.02$ ) than users facing high task complexity (mean = 2.54). These results thereby provide partial support for H5.

ABI users, overall, rate the training received and their preparedness for using ABI as less than adequate; however, the comparison of means (Table III) across the adequacy of ABI training categories indicate significant differences. All mean scores of the ease of use and ABI acceptance measures are significantly greater for users who rate the ABI training received as very adequate. Users perceptions regarding the ease of using ABI ( $t = 14.68, p = 0.00$ ) exists in at least one of the categories: not very adequate (mean = 2.41), moderately adequate (mean = 2.81), and very adequate (mean = 3.25). As expected, it appears that users that receive more adequate training on selecting and using relevant ABI are better prepared to use and have more favorable perceptions regarding the ease of using and comprehending the information.

**TABLE II**  
**Regression Analysis with Three Indicators of ABI Acceptance and Independent Variables**

$$X_5 \text{ (ABI Acceptance)} = \alpha_o + B_1X_1 \text{ (Task Complexity)} + B_2X_2 \text{ (Perceived Ease of Use)} + B_3X_3 \text{ (User Involvement)} + B_4X_4 \text{ (ABI Training)} + \varepsilon$$

| Variable  | Coefficient<br>(predicted sign) | Estimate | t-value | p     | Tolerance | VIF  |
|---|---------------------------------|----------|---------|-------|-----------|------|
| <b>Panel A: Perceived Usefulness</b>                                      |                                 |          |         |       |           |      |
| Intercept   | $\alpha_o$                      | 1.81     | 2.67    | 0.009 | -         | -    |
| Task Complexity (H1a)   | $B_1$ (-)                       | -0.20    | -1.31   | 0.194 | 0.79      | 1.26 |
| Perceived Ease of Use (H2a)   | $B_2$ (+)                       | 0.61     | 3.55    | 0.001 | 0.68      | 1.46 |
| User Involvement (H3a)  | $B_3$ (+)                       | 0.14     | 1.16    | 0.252 | 0.86      | 1.16 |
| User Training (H4a)   | $B_4$ (+)                       | -0.22    | -1.63   | 0.108 | 0.73      | 1.38 |
| $R^2 = 0.47, \text{ Adjusted } R^2 = 0.221, F[4, 65] = 4.614, p = 0.002$  |                                 |          |         |       |           |      |
| <b>Panel B: ABI Use</b>   |                                 |          |         |       |           |      |
| Intercept   | $\alpha_o$                      | 1.44     | 2.96    | 0.004 | -         | -    |
| Task Complexity (H1b)   | $B_1$ (-)                       | -0.19    | -1.73   | 0.089 | 0.79      | 1.26 |
| Perceived Ease of Use (H2b)   | $B_2$ (+)                       | 0.24     | 1.96    | 0.054 | 0.68      | 1.46 |
| User Involvement (H3b)  | $B_3$ (+)                       | 0.28     | 3.10    | 0.003 | 0.86      | 1.16 |
| User Training (H4b)   | $B_4$ (+)                       | 0.02     | 0.32    | 0.753 | 0.73      | 1.38 |
| $R^2 = 0.48, \text{ Adjusted } R^2 = 0.235, F [4, 65] = 4.982, p = 0.001$ |                                 |          |         |       |           |      |
| <b>Panel C: User Satisfaction</b>   |                                 |          |         |       |           |      |
| Intercept   | $\alpha_o$                      | 2.00     | 3.28    | 0.002 | -         | -    |
| Task Complexity (H1c)   | $B_1$ (-)                       | -0.28    | -2.01   | 0.049 | 0.79      | 1.26 |
| Perceived Ease of Use (H2c)   | $B_2$ (+)                       | 0.26     | 1.70    | 0.095 | 0.68      | 1.46 |
| User Involvement (H3c)  | $B_3$ (+)                       | 0.20     | 1.73    | 0.089 | 0.86      | 1.16 |
| User Training (H4c)   | $B_4$ (+)                       | 0.14     | 1.67    | 0.247 | 0.73      | 1.38 |
| $R^2 = 0.47, \text{ Adjusted } R^2 = 0.224, F [4, 65] = 4.685, p = 0.002$ |                                 |          |         |       |           |      |

It appears that there are significant differences in user perceptions regarding the usefulness of ABI in performing job-related task activities across ABI training categories ( $F = 3.34, p = 0.04$ ): not very adequate (mean = 3.05), moderately adequate (mean = 2.49), and very adequate (mean = 3.15). With regards to reported ABI use ( $F = 3.50, p = 0.04$ ), it appears that users that receive more adequate training on selecting and using relevant ABI actually use the information to a greater extent than users who ABI training was less adequate: not very adequate (mean = 2.17), moderately adequate (mean = 2.06), and very adequate (mean = 2.57). As compared to users receiving moderate ABI training (mean = 2.81) or very little adequate ABI training (mean =

2.41), overall, users receiving very adequate ABI training (mean = 3.27) on selecting and using relevant ABI are more satisfied with the information. Again, these results support H6.

**TABLE III**  
**Analysis of Difference Between Means: Task Complexity and ABI Training**

**Panel A: Analysis of Differences between Means of ABI Users facing Highly Complex Tasks versus ABI Users facing Low Complex Tasks<sup>1</sup>**

| Variable              | High Task Complexity | Low Task Complexity | <i>t</i> Statistic <sup>3</sup> | Sig. <sup>4</sup> |
|-----------------------|----------------------|---------------------|---------------------------------|-------------------|
| Perceived Ease of Use | 2.60                 | 3.36                | 4.08                            | 0.00              |
| User Involvement      | 1.92                 | 1.38                | 2.22                            | 0.03              |
| User Training         | 2.09                 | 2.45                | 1.37                            | 0.18              |
| ABI Acceptance:       |                      |                     |                                 |                   |
| Perceived Usefulness  | 2.62                 | 3.08                | 1.77                            | 0.08              |
| ABI Use               | 1.17                 | 2.38                | 1.13                            | 0.27              |
| User Satisfaction     | 2.54                 | 3.09                | 2.43                            | 0.02              |

**Panel B: Analysis of Differences between Means Across Levels of Perceived ABI Training Adequacy<sup>2</sup>**

|                       | Not very Adequate | Moderately Adequate | Very Adequate | <i>F</i> | Sig. <sup>4</sup> |
|-----------------------|-------------------|---------------------|---------------|----------|-------------------|
| Perceived Ease of Use | 2.41              | 2.81                | 3.55          | 14.68    | 0.00              |
| Perceived Usefulness  | 3.05              | 2.49                | 3.15          | 3.34     | 0.04              |
| ABI Use               | 2.17              | 2.06                | 2.57          | 3.50     | 0.04              |
| User Satisfaction     | 2.33              | 2.57                | 3.27          | 6.69     | 0.00              |

<sup>1</sup>The mean value of 2.63 is used as the cutoff point for classifying respondents' task structures as either high task complexity ( $\geq 2.63$ ) or low task complexity ( $< 2.63$ ).

<sup>2</sup> Respondents composite scores for the training variable are used to categorize users into three percentile groups (not very adequate, moderately adequate and very adequate) based on their perceptions of the adequacy of the ABI training received. Users with a composite training score below the 33rd percentile, between the 33rd and 67th percentile, and above the 67th percentile are assigned to the not very adequate, moderately adequate, and very adequate categories, respectively.

<sup>3</sup>Based on t test of equality of the means for high task uncertainty versus low task uncertainty.

<sup>4</sup> Considered significant at  $p < 0.05$ .

## DISCUSSION, CONCLUSION AND LIMITATIONS

This study extends the current ABCM literature by examining the link between several contextual variables and three widely accepted measure of ABI acceptance (perceived usefulness, ABI use and user satisfaction). The study's findings suggest that the extent to which individuals use and rely on ABI in making cost reduction and process improvement decisions, as well as, their perceptions and level of overall satisfaction with the information is largely influenced by individual-level contextual factors, such as, task complexity, ease of use and user involvement. The relative associations of the contextual variables with the three ABI acceptance

measures indicate that employees may use different standards to evaluate ABI, as suggested by Anderson and Young's (1999) and suggest that alternative measures of ABC success are distinctly related to certain determinants. Ease of use is significantly associated to all three measures of ABI acceptance, whereas, task complexity and user involvement are only significantly associated with ABI use and user satisfaction. User training is not significantly related to the three measures of ABI acceptance.

The results suggest that the analyzability of users' tasks and decision making activities influences the extent to which individuals use and rely on ABI and their level of satisfaction with the information. Turney (1991) proposed that ABI is more useful than traditional cost management information; however, the findings suggest that user rejection of ABI (i.e., negative perceptions, dissatisfaction with or lack of use) will be greater for employees who face a high level of complexity in their task and decision making activities. The results revealed that compared to users facing less complex tasks and decisions, users that perform more complex tasks and decisions are more likely to believe that ABI does not have any performance benefits, not use ABI, be the least satisfied and the most demanding with regards to the level of effort necessary to comprehend and use ABI. There are several plausible explanations for the inverse relations between task complexity and ABI acceptance. First, when users' task activities are complex and/or highly ambiguous, the comprehension and use of ABI may create (or increase) overload and negative perceptions of the usefulness and ease of using ABI. Second, individuals may spend a considerable amount of time verifying and reconciling ABI with data from traditional systems. (Several ABI users expressed concerns about the accuracy of ABI and the amount of time spent verifying the accuracy of the information.) Third, users may not clearly understand the underlying functionality and benefits of using ABI. Fourth, users may not have received adequate guidance in the use of task-relevant ABI.

The results of this study suggest that level of effort expended to use ABI also plays a critical role in users' initial assessment of the usefulness of the information. The magnitude of the association as compared to the influence of the other contextual variables, suggests, that the ease of using ABI has a strong influence on users beliefs about the performance benefits of using ABI. It appears that unfavorable perceptions regarding the ease of using ABI may reduce the perceived performance benefits of its usage. Creating favorable perceptions regarding the level of effort expended to use ABI also plays a critical role in promoting early ABI use and greater satisfaction with the information. The analysis of the survey responses revealed that the most commonly cited weakness of and reasons for not using ABI are related to the need to validate the data and the level of effort required to comprehend and use ABI. Practitioners must simultaneously focus on developing functional capabilities and output formats that are easy to use while providing relevant information that is reasonably effortless to comprehend.

The results of the study reveal that although involving users in the design of the ABC system may not foster a better understanding of the practical applications and benefits of ABI, user involvement does promote ABI use and greater satisfaction with the information. The aggregate findings, suggest that employees who participated in the design of the ABC system by specifying their information needs were committed to the ABC initiative. However, it is possible that despite user involvement in the design of the ABC system, the actual system may not fit users' needs, provide incremental task relevant information and create unfavorable perceptions of ABI. For instance, employees' involvement in the system design may be limited to mere inclusion or representation, but their suggestions and comments are not considered. Also, user involvement may be limited to a certain aspect of the design process. For example, employees may only

provide input regarding their information needs, but are not involved in the structural aspects of the ABC system design. While, this limited participation may promote “buy in” and voluntary use of the information, users may feel that, as compared to the traditional information, ABI is not useful in performing task and decision-making activities given its limitations. Responses to the survey items indicate that employees did not feel comfortable with the accuracy of the (cost driver) data and are more likely to use traditional cost management information to verify ABI.

Contrary to expectations, the results provide no support for the link between user training and the three measures of ABI acceptance. It is possible that the results in this regard could have been affected by the nature of the ABI training provided by the company. The motivation for H4a, H4b and H4c, assumes that employees were provided with training on the use of the ABC system and online data applications as well as some form of specialized instruction and guidance in the selection and effective use of task-relevant ABI. However, interviews with members of the ABCM development team and the in-depth questionnaire responses revealed that the training provided to the company’s employees related to the education and awareness of the ABC system only and minimal technical assistance provided by ABCM developers on an as needed basis.

From a practical standpoint, the results of this case study emphasizes: (1) that ABI may be better suited for certain individuals and tasks than for others, (2) the importance of designing ABC reports and training programs to accommodate different information needs, and (3) the importance of providing cost driver information that ABC users believe is reasonably reliable, verifiable and useful. Consultants and managers may be better able to identify specific situations most conducive to the application of ABI and the extent to which certain types of ABI will be used most optimally. If properly addressed, these concerns may facilitate early ABI acceptance. There are several notable limitations of the study. The measurement of the adequacy of ABI training received and the possibility that unspecified variables may impact ABI acceptance. The other limitations are consistent with the inherent weaknesses of survey (e.g., demand effects, self-selection bias and halo effect), self-report measure of usage and case study research.

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1 The goal of ABC is to provide improved cost data by using a causal relationship of cost driver to activities to allocate costs. Whereas, ABC, success maybe referred to as the ability of organizational members to actually use ABI to improve decision-making to achieve customer value and increase performance (Player and Keys 1995).

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- 2 Minor modifications are made to the original model annually.
  - 3 The questionnaire was adapted to the Internet and the applicable computer software program based on Dillman (2000) and assistance from representatives of an independent computer technology firm. This independent firm was also responsible for the setup and hosting of the survey on the Internet. The Web survey was constructed with the following features. A message providing a brief explanation of the survey, its format and other pertinent information was included on the first screen of the survey. Second, specific instructions for completing the survey were provided throughout the survey. Third, the survey questions and response choices were presented in a manner consistent with traditional paper surveys. Fourth, respondents were not required to answer a particular question before proceeding to the next question (Dillman 2000). Computer literacy was not a major concern in this study due to the nature of the sampled population. Based on conversations with the company liaison, the sampled employees were fairly sophisticated in regards to computer use (e.g., high rates of computer use).
  - 4 To test for evidence of nonresponse bias, Web survey respondents were divided into three groups according to the order of submission. Comparisons of mean variable scores of the research variables and demographic information for the first and last groups indicate no statistically significant differences exist between these two groups. The results of the examination suggest that there are no significant differences in responses based on order of submission.
  - 5 This approach to measuring task complexity is suitable because task characteristics are not defined in term of individual attributes, such as cognitive style, performance or perceptions. As such, potential confounding effects of task and individual factors are minimized and will not pose a serious threat to construct validity. Furthermore, task descriptions, as compared to evaluative opinions of tasks, will provide for increased predictive and discriminant validity between other variables, particularly cognitive complexity and user satisfaction (Saunders and Courtney 1985).
  - 6 The results of confirmatory factor analysis reported that two components with eigenvalues greater than one were extracted. All ten items measuring user satisfaction with ABI loaded high on the first component; however, only three items have loadings greater than 0.50 on the second component (eigenvalue and percentage of variance explained are 1.36 and 13.59 percent, respectively). The second component is not used in subsequent analyses.
  - 7 The evaluation of mean differences using a series of four separate univariate ANOVA or t tests using 0.10 as the significance levels increases the experiment-wise Type I error rate. Across the four mean comparison tests, the probability of a Type I error lies somewhere between 0.10 percent and 0.34 percent. One could argue that multivariate analyses of variance (MANOVA) would control for the experiment-wise error rate by providing a overall tests of mean difference. However, due to sample size constraints, low inter-correlations among all four dependent variables, the results of one-way ANOVA and t tests are more appropriate than a single MANOVA (Hair et al. 1998). Also, controlling the experiment-wise error rate is not as critical considering the results of the mean comparisons are provided primarily for descriptive analysis, support for the achievement of a heterogeneous sample and have no impact on the results.
  - 8 To compare means differences in terms of the level of task complexity, the sampled ABI users were classified according to their task complexity. Highly complexity tasks are defined as those equating to or exceeding (less than) the overall task complexity mean value of 2.63.



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