EXPECTANCY THEORY AS THE BASIS FOR ACTIVITY-BASED COSTING SYSTEMS IMPLEMENTATION BY MANAGERS

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ABSTRACT

Many studies, motivated by concerns for activity-based costing (ABC) implementation efforts being less than successful, have suggested that the lack of success in this area stems more from behavioral, as opposed to technical, factors. This concern for the behavioral aspects of systems implementation has also emerged from much of the more general information systems research examining determinants of implementation success. Accordingly, the purpose of this study is to determine if a popular process theory of motivation, expectancy theory, would be useful in explaining the motivation of managers to incorporate ABC information into their job. Data obtained from two experiments employing a judgment modeling methodology support the relevance of both the valence and force models of expectancy theory in this context. Further, the judgments provided by the subject managers suggest they perceive improved product cost accuracy as the most beneficial outcome of ABC use, followed by an

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equivalent appreciation for both an enhanced ability to communicate the underlying economics of the firm and to identify non-value-added activities. Additionally, subject managers exhibited a greater concern for the possibility that obtaining the data to maintain the ABC system would be difficult and costly than they did for concerns that the ABC information would increase the level of complexity of the information that they use.

BACKGROUND

For well over a decade, the literature discussing activity-based costing (ABC) suggests that traditional cost allocation systems systematically distort product costs and consequently taint the information managers rely on for decision-making (Cooper & Kaplan, 1988; Lere & Colson, 2002). Accordingly, ABC costing procedures have been offered as a way to rectify this cost distortion dilemma, by providing more sophisticated costing information necessary for management to make more effective decisions in the areas of pricing, product mix, process improvements, etc. While the technical aspects of these costing procedures are intuitively appealing and are often responsive to the cost distortion dilemma, survey evidence suggests that many organizations adopting ABC are not experiencing the benefits anticipated (e.g., see Innes, Mitchell, & Sinclair, 2000). More specifically, some organizations report lack of success in implementing the new costing system (Innes & Mitchell, 1995), possibly representing the situation where the ABC system remains in the "analysis" stage, where the model is continually refined but never reaches the "action" stage, where the more sophisticated costing information is incorporated into the decision-making of management (Cooper, Kaplan, Maisel, Morrissey, & Oehm, 1992; Cokins, 2000). In essence, these concerns are the same as those that have motivated much of the era of information systems (IS) research investigating new IS implementation efforts (e.g., Swanson, 1988). Accordingly, it is important to realize that ABC constitutes a new IS and is thereby subject to the same user acceptance concerns that have typically plagued many new IS implementation efforts (Leonard-Barton, 1988).

This era of IS research has considered system utilization as one primary indicator of IS success (e.g., Barki & Huff, 1985; Ginzberg, 1981) and has consequently focused on the identification of variables associated with system use. These variables often include characteristics of the factors related to the IS implementation such as the user (e.g., personality variables, decision style)

(e.g., Chandrasekaran & Kirs, 1986), the system (e.g., accuracy, timeliness, relevance) (e.g., Baril & Huber, 1987), the organizational context (e.g., degree of centralization, size, growth rate) (e.g., Franz & Robey, 1986), and the implementation process (user involvement, top management support) (e.g., Fuerst & Cheney, 1982). Few consistent findings have emerged from this stream of research. While the variables mentioned above have been found to be associated with system use in one or more studies, their significant relationships with system usage have not been consistently demonstrated across studies. Accordingly, many of the post-hoc models differ in form and content, suggesting poor generalizability of results from this era of research (Nichols, 1981). This lack of consistency among results is attributed to the atheoretical approach of these studies (Ives & Olson, 1984).

Not surprisingly, the stream of ABC research motivated by the same user acceptance concerns appears to be focused on the same quest of identification of implementation factors associated with "successful" ABC implementation. Further, the factors considered in these studies are nearly identical to the user, system, organizational, and implementation process factors used in the prior IS era (see Table 1 in Anderson & Young, 1999 for a concise and comprehensive literature review summary). And of no further surprise, the resulting post-hoc models differ with respect to the set of variables included and path linkages deemed statistically significant.

An additional commonality between general IS research and research specific to the ABC context is that this gap between the ability to develop new managerial information technology, and to effectively use it is seen to result more from behavioral-related rather than system-related factors regardless of the specific work context (Lucas, 1975; Turner, 1982; Isaac, Zerbe, & Pitt, 2001; Anderson & Young, 1999; Chenhall, 2004). And while Chenhall (2004) notes, "… a difficulty exists in developing hypotheses as existing theories do not relate specific ABCM implementation factors to success, and empirical work varies in terms of effectiveness constructs, duration of implementation, and units of analysis," a common IS contention has been that the research in this area not only underutilizes existing knowledge in the behavioral sciences but also fails to tie implementation research to existing, more general models of work behavior (Robey, 1979; Ginzberg, 1980; Ives & Olson, 1984).

In response to the dearth of theoretically-based studies, Davis et al. (1989) employed a technology acceptance model to understand the system utilization behavior of individuals confronted with new technology. Their seminal findings indicate that system utilization is determined by individuals' behavioral intentions to use the system, which in turn are influenced by user

perceptions of the system's perceived usefulness and ease of use. Interestingly, these constructs are quite similar to the components of expectancy theory, a well established process theory of motivation, which has been found to generalize to a wide variety of contexts. Of specific interest to this study is the relevance of expectancy theory to the IS context, which was noted by researchers modeling the process of social change associated with operations research implementation (Vertinsky, Barth, & Mitchell, 1975). Additionally, Robey (1979) interpreted research results within the framework provided by expectancy theory in relating the extent of system use to user attitudes. Subsequently, other researches have noted the applicability of expectancy theory to IS-related research in a variety of work contexts. DeSanctis (1983) and Snead and Harrell (1994) found support for expectancy theory to model user acceptance of decision support systems, while Griffin and Harrell (1991) found expectancy theory was able to explain the motivation of a manager to adopt just-in-time management practices.

Accordingly, this study suggests that expectancy theory represents a reasonable conceptual framework for explaining the motivational force acting upon a manager to incorporate a newly developed ABC system into his/her job. This theory was chosen given its demonstrated generalizability to the IS and managerial contexts subsumed by ABC. An additional appeal of the theory is that it is a process theory of motivation and requires a within-person focus. These attributes are consistent with the findings of Anderson and Young (1999) who found significant respondent effects in their analysis and who allude to the value of process theories in this area of inquiry. And while most studies correlate use with financial performance measures (e.g., Ittner, Lanen, & Larcker, 2002), the focus of this study is to employ expectancy theory to identify the determinants of the intentions to use ABC; use is a necessary (but insufficient) condition that the ABC system will lead to operational, and ultimately, financial improvements.

EXPECTANCY THEORY

As originally formulated by Vroom (1964), expectancy theory explains how an individual chooses between alternative forms of behavior and continues to be used in a variety of contexts to provide a motivation theory-based explanation for individual behavioral intentions (Baker, Ravichandran, & Randall, 1989; Fusilier, Ganster, & Middlemist,1984; Harrell, Caldwell, & Doty, 1985; Nickerson & McClelland, 1989; Isaac et al., 2001). The essence of expectancy theory proposes that individuals will exert effort to do those

things that are expected to lead to outcomes that they value (or find attractive); it has often been referred to as an expectancy-value theory. Thus, an individual's perception of the likelihood that effort will lead to specific outcomes, coupled with the perception of the attractiveness of those outcomes, are proposed under the theory to be important determinants of that individual's motivation to perform particular acts. In the context of this study, the theory proposes that the motivation of a manager to use an ABC system is determined by his/her perception of the likelihood that the ABC system will lead to specific outcomes, coupled with the his/her perception of the attractiveness of those outcomes.

The original formulation of the theory incorporates the determinants of motivation into two models, the valence model and the force model (Vroom, 1964). The models are distinguished by the type of outcome each incorporates, as expectancy theory makes a distinction between two types of outcomes: first-level outcomes and second-level outcomes. A first-level outcome is the initial outcome directly expected from exerting effort, and in the context of this study, occurs when a manager incorporates the ABC information to a great extent in his/her job. This willingness to use the ABC information is one of the dimensions that DeLone and McLean (1992) suggest comprise the multi-dimensional construct of IS success. Second-level outcomes are outcomes or consequences to which the first-level outcome is expected to lead. In the setting of this study, a second-level outcome occurs as the result of a manager making extensive use of the ABC system in his/her job. Second-level outcomes are conceptually consistent with the individual impact (effect of information on user behavior) and organizational impact (effect of information on organizational performance) dimensions of IS success identified by DeLone and McLean (1992).

Whereas, the valence model describes how individuals consider the likelihood and attractiveness of second-level outcomes when forming assessments of attractiveness of a first-level outcome, the force model proposes that individuals form behavioral intentions by combining this attractiveness assessment with their perception of the likelihood that their effort will lead to the realization of the first-level outcome. Each model will be discussed in turn.

THE VALENCE MODEL

The valence model predicts the valence (attractiveness) of a first-level outcome, to an individual as a function of the sum of the products of the

valences of associated second-level outcomes and the strength of the perceived relationship between the first-level outcome and its associated second-level outcomes. This model therefore explains the valence of a particular act (or kind of behavior), as follows:

$$V_j = \sum_{k=1}^{m} V_k I_{jk} \tag{1}$$

where V_j is the valence to an individual of the first-level outcome j. V_k corresponds to the valence of the second-level outcome k, while I_{jk} is the strength of the relationship between the first-level outcome j and the second-level outcome k. V_j represents a manager's assessment of the attractiveness of using the ABC system extensively in performing his/her job, which is the attractiveness of the first-level outcome, j. V_k describes the attractiveness of each second-level outcome expected to result from the manager making maximum use of the ABC system, while I_{jk} describes the probability of each second-level outcome resulting from this maximum use.

Five second-level outcomes resulting from ABC system use are employed in this study, and are: (1) increased complexity of information used for decision-making; (2) more accurate identification of product costs; (3) increased ability to communicate underlying economics of the firm; (4) difficulty of obtaining needed information on a sustained basis; and (5) identification of "non-value-adding" activities. Support for each outcome is presented.

(1) *Increased complexity of information used for decision making* Typically, the single cost driver approach is considered simple, but not adequate. Consequently, other factors are introduced to more appropriately model the underlying economic complexity of the firm. While this is particularly important given today's complex manufacturing processes, the resulting complexity can overwhelm the user of the system (Cooper cited in Brinker, 1990; Keller & Krause, 1990). Accordingly, the potential user of an ABC system must consider this necessary increase in complexity when making an adoption decision.
(2) *More accurate identification of product costs* This benefit is identified as a key, desirable outcome related to the implementation of an ABC system, as there is perceived need for accounting systems capable of accurately capturing product cost information in the rapidly changing manufacturing environment (Howell & Soucy, 1988; Brunton, 1988; Anderson & Young, 1999; Cokins, 2000). This enables management to gain insight into the actual cost of producing particular products and servicing

specific customers (Cooper et al., 1992; Lere & Colson, 2002) in a variety of strategic decision contexts (make versus buy, product mix, outsourcing, etc.).

(3) *Increased ability to communicate the underlying economics of the firm* There has always been a problem understanding cost behavior patterns in a firm. In many cases, simplistic cost application models (such as all overhead applied on the basis of direct labor hours used) mislead users into thinking that application rates serve as a surrogate for the underlying economy (cost behavior) of the firm. ABC costing models, although more complex, do a much better job of communicating cost implications of business decisions. Also, the wide involvement of personnel in developing the ABC model provides some assurance that all concerned agree on the underlying economics of the firm (King, 1991). Thus, implementing an ABC system will improve communication (Cooper cited in Brinker, 1990), and will communicate cost information to all relevant groups, such as product design engineers (Turney cited in Brinker, 1990).

(4) *Difficulty of obtaining needed information on a sustained basis* By design, a more complex system is more costly (Turney cited in Brinker, 1990). In fact, case studies show that cost driver information is more costly to obtain (Cooper et al., 1992). Shillinglaw (1989) observes that management's unwillingness to adopt ABC concepts may be driven by reluctance to disrupt existing routines, the added cost of multiple driver systems, and the fact that management has not been convinced that added accuracy would produce significant incremental benefits. Often, these are not one-time costs. For example, distribution models must be maintained on an ongoing basis, and activity drivers must constantly be reviewed. As procedures change, new ABC models must be developed or cost accuracy will be lost. Accordingly, this ongoing maintenance can be a very costly process.

(5) *Identification of non-value adding activities* Process control is a major focus in the new manufacturing environment; this focus is congruent with ABC implementation requirements for the firm to identify activities that drive costs. Not only does this identify the cost of the activity, but it highlights the causes of work and helps identify improvement opportunities (Turney, 1992). Firms that implement ABC systems to identify product costs are frequently searching for ways to eliminate the need to perform some activities entirely (King, 1991). In fact, many ABC projects require not only an identification of product costs, but focus on process value analysis and cost reduction as well (Ostrenga, 1990). This

approach is consistent with modern management focus on the customer whereby what is important to the customer is what defines ''value-added'' as opposed ''non-value-added'' activities (Steimer, 1990; Cooper et al., 1992; Borthick & Roth, 1995; Carolfi, 1996).

THE FORCE MODEL

In the force model, Vroom (1964) hypothesizes that the motivational force acting on an individual to perform a particular act is a function of the sum of the products of the valences of the first-level outcome and the expectancy (probability) that the act will be followed by the attainment of this first-level outcome. The force model therefore explains the process by which an individual chooses to behave in a particular manner, as follows:

$$F_i = V_j E_{ij} \tag{2}$$

where F_i is the motivational force acting upon an individual to perform act i; E_{ij} is the expectancy or likelihood that act i will be followed by the first-level outcome j; V_j the valence of outcome j, is the link between Eqs. (1) and (2), as this variable is common to both equations. In the context of this study, an individual's decision to exert a particular effort level in order to use the ABC system to the maximum extent (F_i) indicates that individual's behavioral intentions, and reflects the level of motivation acting upon him/her. Moreover, that level of motivation to exert a particular effort level is explained by the attractiveness of using the ABC system (V_j) and the expectation that the choice of a particular effort level will result in being able to maximally use the ABC system (E_{ij}). A diagrammatic representation of the valence and force models is presented in Fig. 1, which highlights the V_j variable linkage of both models.

HYPOTHESES

The general research question underpinning this study is: Do the variables of the expectancy theory valence and force models explain the motivation of a manager to make voluntary use of an ABC system? The following hypotheses emerge from this question and from the discussion to this point:

H1a. The valence model will explain a manager's perception of the attractiveness of incorporating ABC information into his/her job.

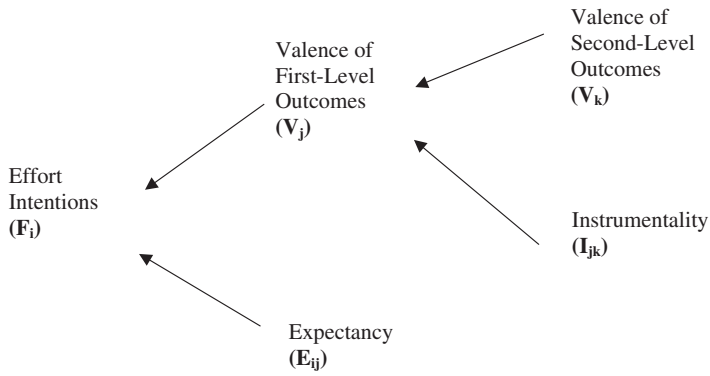

Fig. 1. Diagram of Expectancy Theory Variables.

H1b. On average, the second-level outcome valences will be positive for outcomes (2), (3), (5), and negative for outcomes (1), (4).

H1c. There will be no differences between the relative attractiveness for outcomes (2), (3), (5), and the relative unattractiveness for outcomes (1), (4).

H2. The force model will explain a manager's motivation to incorporate ABC information into his/her job.

The first three hypotheses (H1a–H1c) relate to the valence model of expectancy theory (Eq. (1)). H1a predicts that the attractiveness of using an ABC system will be determined by the attractiveness of the outcomes associated with its use and the strength of the manager's perception that these outcomes will result from using the ABC system. Presuming confirmation of H1a, H1b asserts that the sign of the second-level outcome valences (V_k) will correspond to the assertions in the literature that second-level outcomes involving more accurate identification of product costs (2), increased ability to communicate underlying economics of the firm (3), and identification of "non-value adding" activities (5) will be perceived as attractive (positively) by managers, while increased complexity of information used for decision-making (1), and difficulty of obtaining needed information on a sustained basis (4) will be perceived as unattractive (negatively) by managers. Presuming confirmation of H1b, H1c in null form merely invites an exploration of the relative measures of attractiveness and unattractiveness obtained for the second-level outcomes. H2 presumes support for H1a and is based upon the force model of expectancy theory (Eq. (2)). H2 predicts that a manager's motivation to use an ABC system will be determined by his/her perceptions

of the attractiveness of using the ABC system and perceptions of the probability that an effort to incorporate the ABC system into his/her job will be successful.

Support for H1a and H2 would imply that the variables of the valence and force models of expectancy theory are determinants of a manager's motivation to make voluntary use of an ABC system. As discussed earlier, this would imply that expectancy theory might provide an appropriate conceptual framework for identifying factors that determine a manager's intention to use an ABC system. This may, in turn, suggest practical approaches for increasing the voluntary utilization of ABC systems.

METHOD

Study Design

Vroom (1964) describes the force model as an individual choice model. Moreover, many researchers argue in favor of a within-person approach to studies that examine the theoretical relationships predicted by expectancy theory models (Harrell & Stahl, 1984; Kopelman, 1977; Wanous, Keon, & Latack, 1983; Wolf & Connolly, 1981). Studies that employ the within-person approach require measurements of effort level to be obtained from each participant under different expectancy-valence combinations. With this approach, the data for each individual are separately analyzed, usually by correlating the expectancy-valence motivation measures and effort level measures obtained for different situations. An advantage of the within-person approach is that many of the difficulties that can attenuate research findings, such as response bias, between-persons variance, and the failure to use ratio measurement scales are avoided (Arnold & Evans, 1979). It is noted that Anderson and Young (1999) determined that the individual should be the "unit of analysis" in this type of inquiry given their findings of significant respondent effects.

Noting the within-person nature of expectancy theory, Mitchell and Beach (1977) and Zedeck (1977) proposed that the judgment modeling approach frequently employed to examine cognitive issues (Ashton, 1982; Libby, 1981) represents a methodology congruent with the individual focus of expectancy theory. This methodological approach is now well established in expectancy theory research (Snead & Harrell, 1994; Baker et al., 1989; Butler & Womer, 1985; Harrell et al., 1985; Harrell & Stahl, 1984; Rynes &

Lawler, 1983; Stahl & Harrell, 1983) and was employed to gather the data for this study.

Judgment modeling involves providing an individual with a set of variables or cues with which to arrive at a particular judgment or decision. Multiple sets of these cues are presented, each representing a unique combination of strengths or values associated with the cues. A separate judgment is required from the individual for each unique combination of cue strengths presented. Various statistical techniques make use of the resulting multiple judgments and associated cue strengths in an effort to infer the strategy of cue usage employed by the individual in arriving at the judgments.

Measures

A judgment-modeling-based decision-making exercise was developed for the ABC system implementation for this study, which presented a number of situations, each representing a hypothetical, newly developed ABC system. Each situation required the participant to indicate the valence associated with making maximum use of the ABC system (V_j in Eq. (1)) and the level of effort the participant would exert to make maximum use of the ABC system (F_i in Eq. (2)). Maximum use is defined as relying upon the information generated by the ABC system to a great extent in performing the job and is consistent with the "extensive use of ABC" focus incorporated in the study by Ittner et al. (2002). The exercise instructions provided to the participants are shown in Exhibit 1, with a sample situation from the exercise presented in Exhibit 2.

The exercise was designed to incorporate each of the essential elements of the valence and force models (Eqs. (1) and (2)). The following discussion relates the elements of the sample situation provided in Exhibit 2 to these models. The five items presented prior to *Decision A* correspond to the second-level outcomes described in Vroom's (1964) valence model; the relevance of these five outcomes to ABC system implementation has already been indicated. *Decision A* represents the first-level outcome valence (V_j in Eqs. (1) and (2)), or the overall attractiveness of using a new ABC system to the maximum extent, given the likelihood that these five second-level outcomes would result from this use.

Further information is presented following *Decision A*. This likelihood information corresponds to E_{ij} in Eq. (2), and represents the expectancy that, if the individual exerts a great deal of effort, he/she will be able to incorporate the information generated by the ABC system maximally into his/her job.

Exhibit 1. Activity-Based Cost Accounting System Exercise Instructions.

Assume you are a product manager of a manufacturing company charged with the responsibility of deciding upon and recommending courses of action from among many alternatives. Your decisions and recommendations are based largely on your assessment of the cost impacts. A newly developed Activity Based Cost Accounting (ABC) system is available for your use which traces the cost of significant activities performed within your firm to products, customers, and other cost objectives. The system identifies the activities that incur costs (cost drivers), assigns a cost to each cost driver, and allocates these costs to specific cost objectives. Your use of this system is voluntary, and could range from minimum to maximum use. Minimum use essentially implies that you will continue to perform your job as you have always done, utilizing former cost allocation models. Maximum use means that you will rely upon the information generated by the ABC system to a great extent in performing your job.

Given this background, this exercise presents 32 situations; each different with respect to the likelihood of certain impacts associated with your making MAXIMUM use of the ABC system and with respect to the likelihood of your being able to incorporate the information generated by the ABC system to the MAXIMUM extent into your job. You are asked to make two decisions for each situation. You must first decide how attractive it would be for you to use the ABC system to the MAXIMUM extent (DECISION A). You must next decide how much effort you would exert to use the ABC system to the MAXIMUM extent (DECISION B). Use the information provided for each situation to reach your decisions. There are no "right" or "wrong" responses, so express your true beliefs openly. IT IS IMPORTANT THAT YOU PROVIDE RESPONSES FOR BOTH DECISION A AND DECISION B FOR ALL 32 SITUATIONS (situations are presented on both sides of the page); otherwise your responses will not be usable. Also, please provide the general information asked for on the last page of the exercise. Thank you for your participation in this project.

Next, participants arrive at *Decision B* by implicitly considering both the valence of maximum ABC system use (their *Decision A*) and the expectancy information. *Decision B* corresponds to F_i in the force model (Eq. (2)) and reflects the participant's motivation to use the new ABC system.

Two levels of likelihood (10% and 90%) were used for both the instrumentality associated with second-level outcomes (I_{jk}) and the expectancy variable (E_{ij}). The resulting situations, containing unique combinations of instrumentality and expectancy values, were developed by systematically varying the instrumentality and expectancy values from situation to situation. Furnishing each participant with multiple cases permits obtaining measures of motivation force levels under varied circumstances. This is a prerequisite for the within-person application of expectancy theory. The situations were presented in random order to avoid response bias.

Exhibit 2. Example Situation.

If you incorporate the information generated by the ABC system to the MAXIMUM extent into your job, the likelihood that–

the information that you use to make your decisions will be more complex is.....	LOW	(10%)
you will be able to more accurately identify your product costs is.....	HIGH	(90%)
you will be better able to communicate the underlying economics of the firm to subordinates and superiors is.....	HIGH	(90%)
it will be costly and difficult to obtain the needed information from employees on a continual basis is.....	HIGH	(90%)
you will be able to identify activities that do not add value to your products is.....	HIGH	(90%)

DECISION A: With the above outcomes and associated likelihood levels in mind, indicate the attractiveness to you of incorporating the information generated by the ABC system to the MAXIMUM extent into your job.

−5	−4	−3	−2	−1	0	+1	+2	+3	+4	+5	
Very Unattractive											Very Attractive

FURTHER INFORMATION: If you exert a great deal of effort, the likelihood you will be able to incorporate the information generated by the ABC system to the MAXIMUM extent into your job is..... HIGH (90%)

DECISION B: Keeping in mind your attractiveness decision (DECISION A) and the FURTHER INFORMATION, indicate the level of effort you would exert to incorporate the information generated by the ABC system to the MAXIMUM extent into your job.

0	1	2	3	4	5	6	7	8	9	10	
Zero Effort											Great Deal of Effort

The clear advantage of obtaining measures using this experimental approach is its ability to control for the many potential "nuisance effects" likely to become entangled with the behavioral factors impacting the motivation of managers to implement ABC. Specifically, differences among respondents with respect to uncertainties pertaining to the costs and benefits of the ABC and extent of system use, and differences with respect to the phase of adoption/system maturity are controlled for (Anderson & Young, 1999).

Subjects

Data to test the hypotheses were gathered from two experiments. The first experiment employed professional MBA students (PMBA) from two midwestern universities as subjects. The PMBA program is designed primarily for individuals who occupy full-time managerial positions. Each of these subjects completed the decision-making exercise (Exhibit 2), consisting of 32 situations, each situation representing a unique instrumentality/expectancy combination. A one-half fractional factorial design was incorporated into the five second-level outcomes shown prior to *Decision*

A ($2^5 = 32 \times 1/2 = 16$ combinations); these 16 combinations were then presented at two levels of expectancy (10 and 90%) to obtain 32 unique cases ($2^5 = 32 \times 1/2 = 16 \times 2 = 32$). A total of 54 individuals provided useable responses: 41 males and 13 females. The typical participant was 28 years of age, had been with his/her current employer for about 4 years, and supervised seven subordinates. Each had been exposed to the ABC subject matter as part of the graduate management accounting course.

The second experiment obtained data from the midwestern regional Institute of Management Accountants (IMA) members. A shorter version of the decision-making exercise used in the first experiment was mailed to 390 individuals on the regional IMA mailing list. This shorter version was identical in every respect to the instrument used in the first experiment, except that only 16 situations representing unique combinations of instrumentality/expectancy were used. For this group, a one-quarter fractional factorial design for the instrumentalities of the second-level outcomes was employed. The resulting eight situations ($2^5 \times 1/4$) were then presented at two levels of expectancy, generating the 16 situations. This shorter version permitted testing of the hypotheses and was thought to be more "inviting" for mailing list respondents. A total of 67 (17%) individuals responded, with 48 providing usable responses. The vast majority of unusable responses were decision-making exercises returned by individuals indicating they were retired, but still active with the IMA. Demographic information collected from respondents providing usable responses revealed that 12 were female and 34 male (two did not report), with the average age reported being 41 years. Respondents indicated they had been with their present employer for an average of 10 years and supervised six individuals.

RESULTS

Given the within-person methodological approach used, testing the two research hypotheses required a sequence of steps. These steps and corresponding results are discussed for each of the hypotheses.

H1a–H1c

H1a predicts that the valence model of expectancy theory will explain a manager's perception of the attractiveness (valence) of making maximum use of a new ABC system. This hypothesis was tested by estimating a multiple

regression model for each participant, as the individual is the appropriate unit of analysis due to the within-person nature of expectancy theory. *Decision A* (V_j in Eq. (1)) serves as the dependent variable, with the five second-level outcomes instrumentalities (I_{jk} in Eq. (1)) serving as the independent variables. Given the orthogonal nature of the research design, the resulting standardized regression coefficients (betas) represent the relative attractiveness of each of the corresponding second-level outcomes to each subject in arriving at *Decision A*. Thus, these betas represent second-level outcome valences, which are the V_k terms in Eq. (1) (Stahl & Harrell, 1983). Results are reported separately for each subject group.

The resulting valence regression model estimation procedure for the IMA group revealed that only one of the participants' models was not statistically significant (at the 0.05 level). Exhibit 3 contains the mean and median R^2 values for the remaining 47 participants having statistically significant models. As indicated, the average R^2 of the 47 significant regression models is 0.86. With respect to the PMBA group, all but five valence regression models achieved a significance level of 0.05 or less. Exhibit 3 indicates the average R^2 of the remaining 49 models is 0.71. Taken together, both experiments provide evidence of the explanatory power of Vroom's (1964) valence model in this ABC system implementation context. Accordingly, H1a is supported as the second-level outcome valences and their associated instrumentalities explain a manager's attractiveness assessment of using the ABC system.

Exhibit 3 presents information pertinent to the examination of H1b and H1c as it reports the mean and median beta (second-level outcome valence, V_k) for each of the five second-level outcomes, referenced as $V_1 - V_5$. The average participant found attractive those outcomes involving improved product cost accuracy, increased ability to communicate the underlying economics of the firm, and identifying non-value-added activities (V_2, V_3, and V_5, respectively). The remaining outcomes involving increased complexity of information and the costs associated with obtaining needed information were perceived as unattractive (V_1 and V_4, respectively). Recalling that these betas represent the relative attractiveness associated with each outcome, H1b is supported for both the PMBA and IMA groups.

Further, pairwise comparisons of the mean values for $V_1 - V_5$ were conducted to examine H1c. For those outcomes perceived as attractive, results revealed that V_2 is larger than either V_3 or V_5 ($p < 0.01$), and that there is no difference between V_3 and V_5 ($p > 0.07$). For those outcomes perceived as negative, $V_4 < V_1$ ($p < 0.01$). These results are consistent for both the PMBA and IMA groups and indicate that managers placed the highest measure of

Exhibit 3. Valence Model Regression Results.

	IMA GROUP (n = 47)		PMBA GROUP (n = 49)	
	Mean	Median	Mean	Median
R^2 (adj)	.86(.78)	.88(.82)	.71(.65)	.73(.68)
V_1	−.12	−.12	−.09	−.13
V_2	.58	.60	.50	.48
V_3	.31	.29	.32	.34
V_4	−.25	−.26	−.20	−.25
V_5	.34	.33	.37	.40

V_1- valence of increased information complexity
V_2- valence of improved product cost accuracy
V_3- valence of improved ability to communicate underlying economics
V_4- valence of difficulty of obtaining information
V_5- valence of identifying non-value-added activities

attractiveness on increased product cost accuracy, and were indifferent between the benefits associated with enhanced ability to communicate the firm's underlying economics and to identify non-value-added activities. In addition, managers viewed more negatively the potential for increased cost/difficulty associated with the continual information gathering requirements than they did the possibility of dealing with more complex information.

H2

H2 predicts that the participants' motivation to implement the ABC system will be a function of the product of the first-level outcome valence (V_j in Eqs. (1) and (2)) with expectancy (E_{ij} in Eq. (2)). The extent to which individuals employ this information multiplicatively (as indicated by Eq. (2)), as opposed to additively, is an ongoing issue in expectancy theory research. Accordingly, this issue was considered in conjunction with the examination of H2.

As with H1a, regression analysis was employed on a subject-by-subject basis to examine H2. The effort decision (*Decision B*) was treated as the dependent variable, with V_j, E_{ij}, and the $V_j{*}E_{ij}$ interaction comprising the independent variables. The significance level of the *t*-statistic associated with the interaction term was examined to determine if it offered significant incremental explanatory power over the additive combination of V_j and E_{ij}. Again, analysis was conducted separately for each subject group.

The results of the analysis performed for the IMA subjects indicate that only 36% of the subjects made use of the multiplicative combination of

expectancy and valence as implied by H2. Further, the average incremental increase in explanatory ability that resulted from including the interaction term was only about 0.04. The corresponding analysis for the PMBA group reveals similar results. Approximately 43% of the subjects in this group incorporated the multiplicative combination of valence/expectancy when forming their effort decisions. However, the average increment to explanatory power from the presence of this interaction term was only 0.03. Taken together, these findings support suggestions that the force model should be modified to reflect the fact that many individuals do not employ (or only marginally employ) multiplicative information-processing procedures when forming motivational level decisions (Stahl & Harrell, 1981).

Exhibit 4 presents the mean and median values for the R^2 and standardized regression coefficients resulting from the force model regression analysis when only the additive main effects are considered. Again, results are presented separately for each group. Mean R^2's for the IMA and PMBA groups are both 0.78. Further, the mean betas for the first-level outcome valence (b_1) for the IMA and PMBA groups are 0.75 and 0.77, respectively, and the mean betas for the expectancy term (b_2) for IMA and PBMA subjects are 0.32 and 0.30, respectively. Results of both experimental groups indicate the participants' motivation toward utilizing ABC information can be explained by the additive combination of expectancy and valence. Moreover, the mean beta information suggests that subjects were influenced more by their perceptions of the attractiveness of ABC system utilization (b_1) than by their expectations that effort would lead them to successfully incorporate the ABC information into their job (b_2). A statistical comparison of these betas reveal that $b_1 > b_2$ for both groups ($p < 0.01$).

These results indicate that when a within-person approach is used, both the valence and expectancy variables of the force model are significant determinants of an individual's motivation to use a new ABC system. However, the results do not support the multiplicative information processing implied by H2, as approximately only 40% of the participants employed multiplicative information-processing procedures in arriving at their motivational level decisions.

LIMITATIONS OF THE STUDY

The source of the strength of this study, its experimental nature, is also the primary source of its limitations. Limitations of this study include hindrances to generalizability, and involve the experimental nature of the task

Exhibit 4. Additive Force Model Regression Results.

	IMA GROUP (n = 47)		PMBA GROUP (n = 49)	
	Mean	Median	Mean	Median
R^2 (adj)	.78(.76)	.84(.82)	.78(.77)	.82(.80)
b_1	.75	.78	.77	.78
b_2	.32	.35	.30	.30

b_1- weight placed on valence/attractiveness of the ABC system
b_2- weight placed on the expectancy of maximum incorporation of ABC information into job

and the method of subject selection. Regarding the task, subjects' responses were gathered experimentally rather than from observation in a real world setting. Thus, only subjects' intentions were measured, and not their actual behavior. Further, the experimental task involved a limited number of outcomes; additional relevant outcomes that were not considered may also be influential. In addition, there is hindrance to external validity due to the non-random selection of subjects, as they (particularly the PMBA students) were selected based on their availability. The low response rate from the IMA membership mailing is attributed to misconceptions on the part of potential respondents as to the time required to complete the instrument. Due to the length of the instrument, it is feasible that responding to each of the 16 situations appeared "uninviting," and consequently discouraged individuals from starting the exercise. However, the corroborating results from the PMBA subject group attenuate non-response bias concerns for the IMA group.

DISCUSSION

The ongoing concerns for investments related to the analysis and development of ABC models to pay economic dividends will only be addressed when managers are motivated to incorporate and act upon ABC information. This same issue has been addressed more generally in the management IS success stream of literature, with some researchers having suggested that expectancy theory provides a theoretical framework capable of explaining the motivation of managers to adopt new IS. The results of the two experiments in this study suggest that the valence and force (additive form)

models of expectancy theory do a reasonable job of explaining the cognitive process a manager evokes when forming ABC implementation decisions.

Valence model results (H1a—H1c) generated relative beta sizes for second-level outcomes that suggest managers perceive improved product cost accuracy as most important, followed by an equivalent appreciation for enhanced ability to communicate underlying economics and to identify non-value-added activities. Additionally, managers exhibited greater concern for the possibility that the continual information demands of the ABC could be difficult and costly to obtain. Of lesser concern to managers is the likelihood that the ABC information would be more complex to process. This pattern of betas suggests that managers may be primarily influenced by outcomes they perceive to be more directly associated with profitability. Accordingly, they may see greater product cost accuracy as having more pervasive benefits in the decision areas of pricing, product mix, outsourcing, etc., while their larger concern for increased difficulty and costs associated with obtaining necessary information is likely perceived to have a more direct negative impact on profits than dealing with more complex information. Relatedly, the responses of those subjects receiving situations involving the highest likelihood of both benefits and costs (90% likelihood for all outcomes) had a mean attractiveness rating (*Decision A*) of $+2.52$ on the -5 to $+5$ scale, which was statistically greater than zero ($p < 0.01$). Thus, the attractiveness of the potential improvements in the areas of product cost accuracy, communication, and process improvements appear to outweigh concerns for increased complexity and the difficulty of acquiring ABC information. Accordingly, managers appear to be willing to absorb the negative aspects of ABC use in order to receive benefits.

Additive force model results (H2) generated relative beta sizes suggesting that managers forming effort to use decisions are more influenced by perceptions of the attractiveness of ABC system utilization than by their expectations that effort would lead to them successfully incorporate the ABC information into their job. Accordingly, this emphasis on attractiveness suggests managers need to be most convinced that their use of the information will likely lead to benefits associated with improved costing accuracy, etc., than they need convincing that they will be able to use the system.

The demonstrated relevance of expectancy theory for the ABC implementation context provides a theoretical framework for both the interpretation of prior research findings and for guiding future research. For example, the benefits of top management support, training, and user involvement on the implementation process may be in improving both the manager's expectancy of ability to use the system and perceptions that this

use is linked with desired outcomes. And based on the findings of this study, improving the belief that use will lead to desired outcomes (instrumentality) is likely to be most influential on the manager's behavioral intentions to use the ABC system.

Further, the perceived attractiveness of these outcomes related to system use (second-level outcome valences) are likely to vary with the type of position held by the manager. For example, production management may be most concerned with complexity and accuracy type outcomes; support functions may be focused more on identification of non-value-adding activities, with finance functions most interested in continual costs of maintaining the ABC system. The potential for these second-level outcome valences to vary may be the source of the cognitive conflict construct that Chenhall (2004) found to intervene between behavioral implementation factors and beneficial outcomes. Future research could employ expectancy theory as the underpinning to more directly test the above assertions. Additionally, the theory could provide the framework to examine the adoption behavior of managers as a function of the degree to which they perceive potential ABC outcomes are congruent with organizational strategies and reward structures.

REFERENCES

Anderson, S., & Young, S. (1999). The impact of contextual and process actors on the evaluation of activity-based costing systems. *Accounting, Organizations, and Society*, *24*, 525–559.

Arnold, H., & Evans, M. (1979). Testing multiplicative models does not require ratio scales. *Organizational Behavior and Human Performance*, *24*(1), 41–59.

Ashton, R.H. (1982). Human information processing in accounting. *Studies in accounting research #17*, Sarasota, FL: American Accounting Association.

Baker, D., Ravichandran, R., & Randall, D. (1989). Exploring contrasting formulations of expectancy theory. *Decision Sciences*, *20*(1), 1–13.

Baril, W., & Huber, G. (1987). Decision support systems for ill-structured problems. *Decision Sciences*, *18*(3), 350–372.

Barki, H., & Huff, S. (1985). Change, attitude to change, and decision support system success. *Information and Management*, *9*(5), 262–268.

Borthick, A., & Roth, H. (1995). Accounting for time: Reengineering business processes to improve responsiveness. In: M. Young (Ed.), *Readings in management accounting*. Englewood Cliffs, NJ: Prentice-Hall.

Brinker, B. J. (1990). *Emerging practices in cost management*. Boston, MA: Warren, Gorham and Lamont.

Brunton, N. M. (1988). Evaluation of overhead allocations. *Management Accounting*, *70*(July), 22–26.

Butler, J., & Womer, K. (1985). Hierarchical vs. non-nested tests for contrasting expectancy-valence models: Some effects of cognitive characteristics. *Multivariate Behavioral Research*, *20*(3), 335–352.

Carolfi, I. (1996). ABM can improve quality and control costs. *Cost and Management*, *70*(May), 12–16.

Chandrasekaran, G., & Kirs, P. (1986). Acceptance of management science recommendations: The role of cognitive styles and dogmatism. *Information and Management*, *10*(3), 141–147.

Chenhall, R. (2004). The role of cognitive and affective conflict in early implementation of activity-based cost management. *Behavioral Research in Accounting*, *16*, 19–44.

Cokins, G. (2000). Overcoming the obstacles to implementing activity-based costing. *Bank Accounting and Finance (Euromoney Publications PLC)*, *14*(1), 47–52.

Cooper, R., & Kaplan, R. S. (1988). How cost accounting distorts product costs. *Management Accounting*, *69*(April), 20–27.

Cooper, R., Kaplan, R., Maisel, L., Morrissey, E., & Oehm, R. (1992). *Implementing activity-based cost management: Moving from analysis to action*. Montvale, NJ: Institute of Management Accountants.

Davis, F., Bagozzi, R., & Warshaw, P. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35*(8), 982–1003.

DeLone, W., & McLean, E. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, *3*(1), 60–95.

DeSanctis, G. (1983). Expectancy theory as an explanation of voluntary use of a decision support system. *Psychological Reports*, *52*(1), 247–260.

Franz, C., & Robey, D. (1986). Organizational context, user involvement, and the usefulness of information systems. *Decision Sciences*, *17*(3), 329–356.

Fuerst, W., & Cheney, P. (1982). Factors affecting the perceived utilization of computer-based decision support systems in the oil industry. *Decision Sciences*, *13*(4), 554–569.

Fusilier, M. R., Ganster, D. C., & Middlemist, R. D. (1984). A within-person test of the form of the expectancy theory model in a choice context. *Organizational Behavior and Human Performance*, *34*(3), 323–342.

Ginzberg, M. (1981). Early diagnosis of MIS implementation failure: Promising results and unanswered questions. *Management Science*, *5*(4), 459–478.

Ginzberg, M. J. (1980). An organizational contingencies view of accounting and information systems implementation. *Accounting, Organizations, and Society*, *27*(4), 369–382.

Griffin, L., & Harrell, A. (1991). An empirical examination of managers' motivation to implement just-in-time procedures. *Journal of Management Accounting Research*, *3*, 98–112.

Harrell, A., Caldwell, C., & Doty, E. (1985). Within-person expectancy theory predictions of accounting students' motivation to achieve academic success. *The Accounting Review*, *60*(4), 724–735.

Harrell, A., & Stahl, M. J. (1984). Modeling managers effort-level decisions for a within-persons examination of expectancy theory in a budget setting. *Decision Sciences*, *15*(1), 52–73.

Howell, R. A., & Soucy, S. R. (1988). Cost accounting in the new manufacturing environment. *Management Accounting*, *69*(August), 42–48.

Innes, J., & Mitchell, F. (1995). A survey of activity-based costing: A survey of CIMA members. *Management Accounting Research*, *6*(2), 137–153.

Innes, J., Mitchell, F., & Sinclair, D. (2000). Activity based costing in the UK's largest companies: A comparison of 1994 and 1999 survey results. *Management Accounting Research*, *11*(3), 349–362.

Isaac, R. G., Zerbe, W. J., & Pitt, D. C. (2001). Leadership and motivation: The effective application of expectancy theory. *Journal of Managerial Issues*, *13*(2), 212–227.

Ittner, C., Lanen, W., & Larcker, D. (2002). The association between activity-based costing and manufacturing performance. *Journal of Accounting Research*, *40*(3), 711–726.

Ives, B., & Olson, M. (1984). User involvement and MIS success: A review of research. *Management Science*, *30*(5), 586–603.

Keller, D. E., & Krause, P. (1990). World class down on the farm. *Management Accounting*, *71*(May), 39–45.

King, A. M. (1991). *The current status of activity-based costing: An interview with Robin Cooper and Robert S. Kaplan. Management Accounting*, *73*(September), 22–26.

Kopelman, R. (1977). Across-individual, within-individual and return on effort versions of expectancy theory. *Decision Sciences*, *8*(4), 651–662.

Leonard-Barton, D. (1988). Implementation characteristics of organizational innovation. *Communications Research*, *15*, 603–631.

Lere, J. C., & Colson, R. H. (2002). Selling activity-based osting. *CPA Journal*, *72*(3), 54–55.

Libby, R. (1981). *Accounting and human information processing: Theory and application*. Contemporary topics in accounting series. Englewood Cliffs, NJ: Prentice-Hall.

Lucas, H. C. (1975). *Why information systems fail*. New York: Columbia Press.

Mitchell, T., & Beach, L. (1977). Expectancy theory, decision theory, and occupational preference and choice. In: M. Kaplan & S. Schwartz (Eds), *Human judgement and decision processes in applied setting* (pp. 203–226). New York: Academic Press.

Nichols, M. (1981). A behavioral analysis for planning MIS implementation. *MIS Quarterly*, *5*(1), 57–65.

Nickerson, C., & McClelland, G. (1989). Across-persons versus within-persons test of expectancy-valence models. *Journal of Behavioral Decision Making*, *2*, 261–270.

Ostrenga, M. R. (1990). Activities: The focal point of total cost management. *Management Accounting*, *71*(February), 42–49.

Robey, D. (1979). User attitudes and management information system use. *Academy of Management Journal*, *22*(3), 527–538.

Rynes, S., & Lawler, J. (1983). A policy capturing investigation of the role of expectancies in decision to pursue job alternatives. *Journal of Applied Psychology*, *68*(4), 620–631.

Shillinglaw, G. (1989). Managerial cost accounting: Present and future. *Journal of Management Accounting Research*, *1*, 33–46.

Snead, K., & Harrell, A. (1994). An application of expectancy theory to explain a manager's intention to use a decision support system. *Decision Sciences*, *25*(4), 499–513.

Stahl, M. J., & Harrell, A. M. (1981). Modeling effort decisions with behavioral decision theory: Toward an individual differences model of expectancy theory. *Organizational Behavior and Human Performance*, *27*(3), 303–325.

Stahl, M., & Harrell, A. (1983). Using decision modeling to measure second-level valences in expectancy theory. *Organizational Behavior and Human Performance*, *32*(1), 23–34.

Steimer, T. E. (1990). Activity-based accounting for total quality. *Management Accounting*, *72*(October), 39–42.

Swanson, E. (1988). *Information system implementation: Bridging the gap between design and utilization*. Homewood, IL: Irwin.

Turner, J. A. (1982). Observations on the use of behavioral models in information systems research and practice. *Information and Management*, *5*(4&5), 207–213.

Turney, P. B. (1992). Activity-based management. *Management Accounting*, *73*(January), 20–25.

Vertinsky, I., Barth, R. T., & Mitchell, V. F. (1975). A study of OR/MS implementation as a social change process. In: R. L. Schultz & D. P. Slevin (Eds), *Implementing operations research/management science* (pp. 253–272). New York: American Elsevier.

Vroom, V. C. (1964). *Work and motivation*. New York: Wiley.

Wanous, J. P., Keon, T. L., & Latack, J. C. (1983). Expectancy theory and occupational/organizational choices: A review and test. *Organizational Behavior and Human Performance*, *32*(1), 66–86.

Wolf, G., & Connolly, T. (1981). Between-subject designs in testing expectancy models: A methodological note. *Decision Sciences*, *12*(1), 39–45.

Zedeck, S. (1977). An information processing model and approach to the study of motivation. *Organizational Behavior and Human Performance*, *18*(1), 47–77.