Managers' Motivational Antecedents To Support Activity-Based Costing Systems

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ABSTRACT

The past three decades have witnessed a growing trend in using activity-based costing systems. Management and accounting research have identified management support as one of the focal points for successful implementation of such systems. However, little research has been done to study managers' motivational antecedents to support activity-based costing systems in the Middle East as well as in the Asian countries. It is expected that the level of support differs from one culture to another. This paper addresses this issue in an experimental setting where 129 managers from two different cultures were asked to respond to judgmental decisions to support activity-based costing systems. Two models of the expectancy theory (the force model and the valence model) were used to measure the motivational support for activity-based costing systems. The authors hypothesized that these models provide better explanations than a chance model. The results of the regression analyses support the research hypotheses. However, the force model had a higher explanatory power than the valence model.

Keywords: Managers' Motivational Antecedents; Activity-based Costing System

INTRODUCTION

The progressive uses of advanced manufacturing technology and information systems have raised challenges to the relevance and appropriateness of traditional cost accounting systems. Johnson and Kaplan (1987) argued that traditional costing systems do not reflect the new competitive environment and fail to produce timely and useful information. In an attempt to overcome some of the problems caused by the mismatch between traditional costing systems and the modern manufacturing environment, several companies have adopted activity-based cost management systems (e.g., Brimson 1991, Howell & Soucy 1987, Johnson 1988, McGowan 1998, O'Guin 1990, Ostrenga 1990).

An activity-based costing (ABC) system focuses on the cost of performing value-added activities, rather than products, to provide more accurate costing information for decision-making. ABC systems trace financial and operating information to significant activities of the firm and use this information to focus effort on achieving enterprise excellence (Turney, 1991).

A review of the accounting literature provides evidence on several success and failure stories regarding implementing ABC (see for example, Selto, 1995; Shields and McEwen, 1996; Roberts and Silvester, 1996, Chea, 2011, Abu Mansor, Tayles and Pike, 2012). Although managerial support has been cited and attributed to success and failure of ABC systems, there is little empirical evidence on the motivational antecedents for such support and whether the level of support differs from one culture to another. As the introduction of ABC systems requires changes in the design and operations of existing accounting information systems, management attitude and support becomes a focal point for successful implementation of these systems.

The remaining parts of the paper are divided into four sections. The next section addresses the motivational aspects of the process of implementing ABC systems using expectancy theory of motivation as the theoretical framework. The next section presents the research method and development of the hypotheses. The third section presents the results while the final section presents summary and conclusions.

THEORETICAL BACKGROUND

Expectancy theory has been a popular research paradigm to study subjects' motivation, choices, actions, and performance in different settings (e.g., Ferris, 1977; Rockness, 1977; Mitchell, 1974; Dillard, 1979; Jiambalvo, 1979; Arnold, 1981; Stahl and Harrell, 1981, 1983; Harrell and Stahl, 1984; Murray and Frazier, 1986; Kren, 1990; Griffin and Harrell, 1991, Ibrahim & Kim, 1996). The theory postulates that an individual will select the behavior to engage in and the level of effort to be exerted on the basis of subjective estimation of the expectancy that the selected action will lead to desired outcomes, and the degree of anticipated satisfaction of these outcomes.

Although the roots of expectancy theory can be traced back to the seventeenth century or even earlier (Bass and Ryterban, 1979), it was Vroom's work (1964), which first introduced the explicit theoretical formulation of the theory in an organizational context. His formulation of the theory involved two main models[1]. The first is termed the "valence" model and deals with the prediction of valences of outcomes. The second model is termed the "force" model and deals with the prediction of force (effort) toward behavior. In both models, an outcome is viewed as anything a person might want to attain. The valence of an outcome for a person, on the other hand, is viewed conceptually as the strength of his/her attitude or affective orientation toward the outcome. Thus, valence refers to the anticipated satisfaction (attractiveness) associated with an outcome and it differs from the value of the outcome, which refers to the actual degree of satisfaction resulting from the attainment of the outcome. A brief description of each of the two basic expectancy models follows:

The Valence Model

The model states that the valence of an outcome (a particular act, event or choice) to an individual is a function of the products of the valences of all other outcomes and the individual's conceptions that this specific outcome will lead to the attainment of the other outcomes (Vroom, 1964, p. 17). Thus, the valence model establishes an "outcome-outcome" association. This association is usually termed "instrumentality" which refers to the perceived correlation between two outcomes (a first-level and a second-level outcome). The valence model can be expressed symbolically as follows:

$$V_j = f\left[\sum_{k=1}^{n} (V_k I_{jk})\right]$$

where

V_j = the valence of the first-level outcome j,
V_k = the valence of the second-level outcome k,
I_{jk} = the instrumentality of outcome j to attain outcome k,
n = the number of outcomes.

In the context of this study, V_j describes the level of attractiveness to a manager to support implementing an activity-based costing system. V_k describes the level of attractiveness of second-level outcomes associated with implementing an activity-based costing system (e.g., rewards for accomplishments, meeting challenges of the new work environment, cost accuracy, etc). The I_{jk} term describes the likelihood that, if the system is implemented, the associated second-level outcomes will be attained.

The Force Model

This model conceptualizes that the force on an individual to perform an act is a function of the valence of all outcomes and the strength of the individual's expectancy that such an act will lead to the attainment of these outcomes. Expectancy is viewed as the individual's belief concerning the likelihood that a particular act will lead to the attainment of the desired outcomes. Thus, the force model establishes, in terms of expectancy, an "action-

[1] Vroom also proposed a third model to predict performance. He postulated performance as a joint function of ability and force.

outcome" association whose strength may range from zero to plus one. The force model can be expressed symbolically as follows:[2]

$$F_1 = \left(\sum_{j=1}^{n} E_{ij} V_j \right)$$

where

F_1 = the motivational force to exert effort to engage in act i,
E_{ij} = the expectancy that act i will lead to outcome j,
V_j = the valence of outcome j,
n = the number of outcomes.

In the context of this study, V_j describes the level of attractiveness to a manager to support implementing an activity based-costing system while the E_{ij} term refers to the expectancy (likelihood) that some particular level of effort will result in the implementation of the system. That is, the force model implies that a manager's motivation to support an activity based-costing system depends on the valence of implementing the system and the likelihood that a particular level of effort to support the system will lead to the system's implementation.

RESEARCH METHODS

Research Design

Until recently, most expectancy theory studies used an across-subjects design where measurement scores of one set of actions (choices) of different individuals were taken and compared (e.g., Ferris, 1977; Dillard, 1979; Jiambalvo, 1979). This across-subjects design has been criticized as conceptually unwarranted since the formulation of expectancy theory calls for a within-subjects design (e.g., Kopelman, 1977; Zedeck, 1977; Parker and Dyer, 1976; Wolf and Connolly, 1981). This paper follows the trend of the current behavioral science literature in using a within-subjects design. Such a design involves comparisons of the motivational scores for each subject in different decisional settings. The particular settings are outlined below under the experimental task.

Selection of Second-Level Outcomes

Prior expectancy theory research raised two issues regarding second-level outcomes. The first issue deals with deciding on the number of second-level outcomes. The second issue deals with the selection of second-level outcomes. For the first, Heneman and Schwab (1972), for example, suggested a large number of outcomes while Kaplan (1985) suggested a relatively small number of important outcomes. In a similar fashion, Griffin and Harrell (1991) limited their choice to four second-level outcomes. For the second issue, Ferris (1977), for example, generated his own list of outcomes while Mitchell (1974) suggested that subjects generate outcomes. Parker and Dyer (1976), on the other hand, suggested a middle-ground approach for selection. A similar approach was used in this paper. A pre-test sample of fifteen subjects were provided with a list of thirteen outcomes that were believed to be associated with the new manufacturing environment and they were asked to rank order these items in terms of importance to them. Furthermore, they were asked to add items that were more important to them but were not listed. This exercise resulted in the identification of four-second-level outcomes that were highly important to the subjects of the pre-test sample. These second-level outcomes are: meeting the challenges of the new work environment in terms of better co-ordination, obtaining more accurate costing information, cost reduction, and improved decision making. Table 1 shows the original thirteen items presented to the initial fifteen subjects who were used as the pre-test sample and the obtained average rankings

[2] This paper used the multiplicative form of the model. However, the findings of some expectancy theory research imply that individuals may employ additive information processing procedure rather than the multiplicative one (e.g., Stahl and Harrell, 1981; Rynes and Lawler, 1983; Harrell and Stahl, 1984; Butler and Womer, 1985).

Table 1: A List of the Initial Second-Level Outcomes

Item	Average Rankings
Improvement in quality of work	8.53
More control over work procedure	7.58
Better co-ordination of activities	4.43
Better communication across functions	6.56
Better use of available information	5.30
Accomplish tasks more quickly	8.65
Possibility of cost reduction	4.15
Obtaining more accurate costing information	1.80
Better chances for successful bidding	5.85
Supports the critical aspects of the firm	9.25
Improved decision making	2.20
Accomplishes more work than before	10.74
Better use of available expertise	9.35

Subjects

This study employed two groups of managers to collect the needed data. The first group consisted of a sample of managers of companies in the Middle East while the second group consisted of managers of Asian companies. A total of 129 managers representing 63 companies that were using a form of activity-based costing systems or were thinking of using activity-based costing systems participated in the study. Each company was represented by two managers to avoid dominance of some companies' representation on the sample. Seventy-six managers of Asian companies (about 59% of the sample) and 53 managers of Middle East companies (41%) voluntarily participated in the study and completed the experimental task during pre-scheduled meetings. The average business experience of the managers in the sample was 12.6 years and their ages ranged from 33 to 49 years.

Experimental Task

Subjects were assigned the task of making judgmental decisions regarding whether to support implementing an activity-based costing system. The judgmental analysis approach for expectancy theory research advocated by Zedeck (1977) and developed by Stahl and Harrell (1981, 1983) was used. This approach uses individuals' decisions as operational measures for valence and motivation. For the purpose of this paper, a decision making instrument was modeled after similar prior studies by Rynes and Lawler (1983), Butler and Womer (1985), Harrell, Caldwell and Doty (1985) and Griffin and Harrell (1991). The decision making instrument had two main sections. The first section provided the subjects with background information about a manufacturing company that intended to implement an activity-based costing system. The second section of the instrument provided the subjects with a set of information for 32 possible cases related to the implementation of an activity based-costing system. The contents of each set of information differed on the assessed levels of the instrumentality of possible outcomes and the likelihood of implementing the system. Each case was presented on a separate page and subjects were asked to make two decisions for each case based on the information provided. An example case from the decision making instrument is presented in the appendix.

Research Hypotheses

The paper has three research hypotheses. The first hypothesis addresses the ability of the valence model to predict managers' motivation (in terms of level of attractiveness) to support ABC systems. Thus, the first hypothesis states that the valence model would predict managers' valences to support ABC systems better than a chance model. This hypothesis is stated in the alternative form as follows:

H_{A1}: The valence will have a higher explanatory power (in terms of adjusted R^2) than a chance model.

The second research hypothesis addresses the ability of the force model to predict managers' motivation (in terms of the level of effort) to support ABC systems. It states that the force model would predict managers'

motivation to support ABC systems better than a chance model. This hypothesis is stated in the alternative form as follows:

H_{A2}: The force model will have a higher explanatory power (in terms of adjusted R^2) than a chance model.

The third research hypothesis deals with the comparative ability of both the valence model and the force model. Since implementation of an activity-based cost system requires actual effort and involvement, one would expect the force model to have a higher explanatory power than the valence model. This research hypothesis is stated in the alternative form as follows:

H_{A3}: The force model will have a higher explanatory power (in terms of adjusted R^2) than the valence model.

RESULTS

The authors analyzed collected data from subjects' responses to the decision making instrument using multiple regression techniques. The results are reported for each expectancy model as follows:

The Valence Model

The first research hypothesis deals with the expectation that the valence model would have a better predictive ability (than a chance model) of the level of attractiveness to managers to support implementing an ABC system. Accordingly, the first step in the data analysis involved regressing each subject's valence decision (decision A--see the appendix) in all of the cases on the probabilities (instrumentality) associated with the four second-level outcomes. All of the regression models were significant for subjects of both Groups. These significant regression models indicate that subjects were able to effectively process the probabilistic information presented in the decision making instrument

Following Stahl and Harrell (1981) and Griffin and Harrell (1991), one could report the standardized regression weights associated with each of the four second-level outcomes, obtained from the regression procedure described above, to indicate the level of valence (V_K) each subject associated with each of the four second-level outcomes. The average valence (V_k) and the range of valences associated with the four second-level outcomes are presented in Table 2 for the two groups of subjects. The table shows that subjects in both groups placed the greatest valence upon obtaining more accurate costing information followed by the improved decision-making in the new work environment

Table 2: Average Values and Ranges of Second-Level Outcomes

Second-level Outcome	Middle Eastern Managers	Asian Managers
Better co-ordination of activities	0.065 (-0.250 to 0.401)	0.108 (-0.151 to 0.389)
Cost reduction	0.179 (0.00 to 0.891)	0.225 (0.057 to 0.438)
Obtaining more accurate costing information	0.710 (0.350 to 0.891)	0.676 (0.393 to 0.801)
Improved decision making	0.253 (0.177 to 0.551)	0.261 (0.000 to 0.464)

Note: n = 53 for Middle Eastern managers and 76 for Asian managers
Numbers in parentheses represent the range for individual second-level outcomes.

The adjusted R^2 values obtained from the individual regression analyses are reported in Table 3. These values provide an indication of the ability of the valence model to explain variations in subjects' valence assessments. A typical person in each of the two groups had adjusted R^2 values of 0.623 (Middle East Managers) and 0.587 (Asian Managers). These results support the first research hypothesis that the valence model will have a higher explanatory power than a chance model.

The Force Model

The second research hypothesis stated that the force model would predict managers' motivation to support implementing ABC systems better than a chance model. To test this hypothesis, a regression model was performed using the additive main effect terms where the individuals' effort-level (F_J) decisions (Decision B--see the appendix) were regressed against the expectancy (E_{ij}) values (10 percent or 90 percent) and the valence (V_j) values (Decision A--see the appendix) to obtain initial R^2 values.[3] These initial R^2 values provide an indication of the ability of the force model to explain variations in a subject's effort-level or motivation.

The adjusted R^2 values obtained from the individual regression analyses, based on the additive model, are reported in Table 3. These values provide an indication of the ability of the force model to explain variations in subjects' effort level assessments. A typical person in each of the two groups had adjusted R^2 values of 0.740 (Middle Eastern Managers) and 0.810 (Asian Managers). While these results support the second research hypothesis, they also indicate that the force model has an improved explanatory power for the Asian managers than the Middle Eastern managers.

Table 3: Adjusted R-Square for the Expectancy Models

Model	Middle Eastern Managers	Asian Managers
Valence Model	0.623 (0.215 to 0.881)	0.587 (0.264 to 0.825)
Force Model	0.740 (0.360 to 0.920)	0.810 (0.650 to 0.970)

Note: n = 53 for Middle Eastern managers and 76 for Asian managers
Numbers in parentheses represent the range for individual R^2 values.

SUMMARY AND CONCLUSIONS

Recent changes in manufacturing environment have raised challenges to accountants and their accounting systems. As a result, many companies have used activity-based costing systems. Some of these systems succeeded in achieving their goals while others failed. Management and accounting research has identified management attitude and support as one of the key success factors for successful implementation of activity-based costing systems. However, little research has been conducted to identify managers' motivational antecedents to support activity-based costing systems and whether the level of support differs from one culture to another. This paper addressed this issue in an experimental setting where 129 managers from the Middle East and Asia (representing two different cultures) were asked to respond to judgmental decisions to support activity-based costing systems. The judgmental decisions were based on the expectancy theory framework.

The results indicate that both the force model and the valence model of the expectancy theory provide better explanations to support activity-based costing systems than a chance model. However, the force model has a higher explanatory power than the valence model. Furthermore, the goal of obtaining more accurate costing information was the main motivational factor for managers to support activity-based costing systems.

The study is subject to some limitations. First, there were no sample frame identifying the companies that used activity-based costing systems or were about to use activity-based costing system in the Middle East and Asia. The study used available public information and feedback from discussions and interviews of managers to make such identification. It is possible that many relevant companies were not included in the study. Second, the study reports the results of a sample of managers who voluntarily agreed to participate. Thus the actual sample is not

[3] A recurring issue in expectancy theory research is whether the multiplicative force model or an additive version is more appropriate. Accordingly, the interaction term (Eij Vj) was forced into the regression model to obtain a second set of R2 values to measure the level of improvement in the model's ability to explain variations in a subject's effort-level or motivation. Significant improvement in R2 value indicates that a subject employed a multiplicative information processing strategy. Otherwise, the subject is presumed to have employed the additive information processing strategy. All of the participants of both groups had significant regression models. 38% of Group One and 44% of Group Two participants employed multiplicative information processing while the remaining participants employed an additive strategy.

representative and the results may have limited generalizability. Third, the results may be biased to the extent that experimental materials do not portray reality. Although every effort was made to make the experimental material as real as possible, the fact that such materials represent a hypothetical company may bias the results. Finally, one might argue for between-subject design as compared to within-subject design.

Future research may address the success factors of known successful implementation of activity-based costing as compared to known failure cases. It is very helpful to know why some companies have successfully implemented activity based costing while others have failed in the same industry or business.

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APPENDEX

A Case Example

If an ABC system is implemented in your company, the likelihood that:

-The system will provide more accurate cost information is	High (90%)
-The system will help meet the challenges of the new work environment is	Low (10%)
-The system will reward managers for accomplishments	Low (10%)
-The system will improve the decision making process	Low (10%)

Decision A: With the factors and associated likelihood levels shown above in mind, please indicate the degree of attractiveness to you of supporting the ABC system by circling a number on the scale provided below:

-5	-4	-3	-2	-1	0	1	2	3	4	5
Very..... Very Unattractive..... Attractive										

ADDITIONAL INFORMATION

If an average level of effort is exerted to implement an ABC system, the likelihood that such a system will be implemented is high (90%).

Decision B: With all of the above information in mind, please indicate the level of effort you would exert to implement an ABC system in your company by circling a number on the scale provided below:

0	1	2	3	4	5	6	7	8	9	10
No Effort .....Average effort .....Greet effort										

NOTES

