An Empirical Study Of Application & Usefulness Of Activity-Based Costing And Activity-Based Management Techniques In Practice

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Abstract

The extent to which ABC and/or ABM techniques have become an active part of decision making apparatus in American companies can be best determined by direct contact with the actual and potential users of these techniques. This way a researcher can empirically and effectively evaluate the degree of usefulness of these techniques in running business operations. Because of the prominent role of Fortune 500 largest Industrial Corporations in American industry, and also their ability to select and implement the latest and most sophisticated accounting techniques for their operations, these corporations were deemed to be the best actual or potential users of ABC/ or ABM techniques, and hence they were selected for this study. Copies of a questionnaire containing 21 questions were mailed to the managers and controllers (via the presidents) of all Fortune 500 corporations in the United States. It was expected that the results of this research would assist the researchers to reject the null and sub-null hypotheses and conclude the degree of use and usefulness of ABC/ or ABM models in business operations and decision-making apparatus.

Null Hypotheses

To understand the extent of benefits achieved by adopting ABC/ABM models in business operations, the following null hypotheses were formulated and tested. It was expected that the outcomes of the statistical tests would allow us to determine whether there was statistical dependency between: (a) reduction in expected costs of new products before manufacturing, (b) reduction in the time required for new product introduction, (c) reduction in the cost of purchased materials, (d) reduction in the manufacturing cost, (e) development of more profitable products, (f) reduction in the number of design changes after production begins, (g) improvement in overall profitability, and the level of use of ABC/ABM in business operations.

Ho_1: There is no statistically significant relation between the reductions in the expected costs of new products before manufacturing and the level of use of ABC and/or ABM in business operations.

Ho_2: There is no statistically significant relation between the reductions in the time required for new product introduction and the level of use of ABC and/or ABM in business operations.

Ho_3: There is no statistically significant relation between the reductions in the cost of purchased materials and the level of use of ABC and/or ABM in business operations.

Ho_4: There is no statistically significant relation between the reductions in the manufacturing cost and the level of use of ABC and/or ABM in business operations.

Ho_5: There is no statistically significant relation between the developments of more profitable products and the level of use of ABC and/or ABM in business operations.

Readers with comments or questions are encouraged to contact the authors via email.

Ho_6: There is no statistically significant relation between the reductions in the number of design change after production begins and the level of use of ABC and/or ABM in business operations.

Ho_7: There is no statistically significant relation between the improved overall profitability and the level of use of ABC and/or ABM in business operations.

Sub-Null Hypotheses

In addition to the above null-hypotheses, the following sub-null-hypotheses have been tested to determine the impact of the company's size (in dollar sales), number of employees, and types of operations on the level of use of ABC/ABM.

SHo_1: There is no statistically significant difference between the size of firm ($ sales volume) and the level of use of ABC and/or ABM in business firms.

SHo_2: There is no statistically significant difference between the company's number of employees and the level of use of ABC and/or ABM in business firms.

SHo_3: There is no statistically significant difference between the company's primary operation and the level of use of ABC and/or ABM in business firms.

Methodology

To test the above set of hypotheses, a questionnaire comprising 21 questions with a cover letter explaining the purpose of the research were sent to the 500 managers and controllers (via presidents) of the Fortune 500 largest industrial corporations in the United States as of October 1999.[2] After 20 days, on November 9, 1999, a follow- up letter, with another copy of the survey questionnaire were mailed to each nonrespondent. Replies received after April 21,2000 were not considered in final data analysis. The first and second mailings resulted in 108 replies (21.6 per cent). Of the 108 replies, 85 were usable and were included in final data analysis.

The data collected in the study were analyzed by using SPSS 10 software. The **Analysis of Variance** (known as **ANOVA**) was used to test the null hypotheses. The main reasons for using ANOVA were:

- The techniques of ANOVA are insensitive to violation of most assumptions such as (1) randomness and independence, (2) normality, and (3) homogeneity of variance.[3]
- The techniques of ANOVA are the most appropriate for solving and analyzing the hypotheses such as those stated in this study.
- The researcher is able to test hypotheses involving either comparisons of three or more groups on a single variable or the interaction of two or more variables.[4]

In performing the Analysis of Variance test, first the One-Factor Between-Subject Analysis of Variance was employed. This test allowed us to determine whether or not there was statistically significant difference between the means of user groups (Table 4) regarding the null hypotheses. Second, the Multiple Comparison Procedures for the One-Factor Between-Subjects Analysis of Variance was used. This test allowed us to further support the rejection of the null-hypotheses by comparing the means of the two groups that had used ABC/ABM at different levels[5].

Data Summary

Tables 1 through 4 summarize the primary operations, number of employees, annual sales, and level of the use of ABC/ABM by the 85 companies that participated in this study.

Table 1
A = Company's Primary Operation

Type of Operation	Frequency	Percent		Cumulative Percent
Transportation Equipment	2	2.4		2.4
Electrical/Electronics	11	12.9		15.3
Precision Equipment	0	0		15.3
Aerospace & Defense	3	3.5		18.8
Pharmaceuticals	4	4.7		23.5
Machinery	1	1.2		24.7
Textiles	0	0		24.7
Food	7	8.2		32.9
Chemicals	2	2.4		35.3
Steel	1	1.2		36.5
Non-ferrous/metal	1	1.2		37.6
Oil, Rubber, Glass	4	4.7		42.4
Pulp & Paper	3	3.5		45.9
Service	15	17.6		63.5
Other[a]	31	36.5		100.0
Total number of respondents	85	100.0		

[a] Telecommunications (5), Insurance (1), Utility companies (5), Consumer Electronics (6), Financial Services (1), Office Equipment Services (1), Wholesale Distribution (1), Air Line Company (1), Energy & Technology & Comm. (4), Health Services (2), Toys (1), Publishing (2), Coatings (1)

Table 2
C = Company's Number of Employees

Number of Employees	Frequency	Percent		Cumulative Percent
1001-2000 Employees	8	9.4		9.4
2001-5000 Employees	13	15.3		24.7
over 5000 Employees	64	75.3		100.0
Total	85	100.0		

Table 3
D = Size of Firm (Company's Annual Sales Volume)

Annual Sales Volume	Frequency	Percent		Cumulative Percent
$700-$999.9 Million	6	7.1		7.1
Over $1 Billion	79	92.9		100.0
Total	85	100.0		

Table 4
Level of Use of ABC/ABM (Groups)

Level of Use of ABC/ABM (User Groups)	Points	Frequency	Percent		Cumulative Percent
Never Used &planning to use In future	1	39	45.9		45.9
Attempted but abandoned	2	2	2.4		48.2
Started and implementing ABC/ABM but not fully implemented	3	**34**	40.0		88.2
ABC/ABM is well established	4	**10**	11.8		100.0
Total		85	100.0		

Note: 44 out of 85 companies had used ABC/ABM in their operations.

Testing The Null Hypotheses

In testing the null hypotheses, the effect and interactions of the **independent variable** (level of use of ABC/ABM) and each of the ensuing **dependent variables:** O_1= reductions in the expected cost of new products before manufacturing, O_2= reductions in the time required for new product introduction, O_3 = reductions in the cost of purchased materials, O_4= reductions in the manufacturing cost, O_5= developments of more profitable products, O_6 = reductions in the number of design change after production begins, and O_7 = improved overall profitability were evaluated. If the results of the ANOVA (One-Factor Between-Subject Analysis of Variance) tests were statistically significant, the null hypotheses were rejected.

To perform the above tests, it was necessary to convert the **level of usage** of the ABC/ABM expressed in the study by the participating firms (table 4) to a numerical scale of 1 to 4 by assigning: (1) point to "never used" or "planning to use in future", (2) "attempted but abandoned", (3) "recently started and implementing ABC/ABM but not fully implemented", and (4) "ABC/ABM is well established". Likewise, the responses of the participating firms regarding the **degree of impact** of the ABC/ABM models on each of the aforementioned dependent variables was scaled numerically by assigning: (1) point "not at all", (2) "somewhat ", (3) "moderately", (4) "mostly", and (5) "extensively". See Table 5 in appendix A.

Result Of Testing Null Hypothesis Number One: Ho_1:

Out of 34 participants who had "recently started to implement ABC/ABM", 5 did not respond to the question O_1 concerning Ho_1. Likewise, 2 out of 10 participants who stated that ABC/ABM had been well established in their companies left question O_1 unmarked (see Table 5 in appendix A). As a result, the ensuing statistical outcomes were based on 37 observations.

The results of the ANOVA (One-Factor Between-Subjects Analysis of Variance) testing of the first null-hypothesis based on the above mentioned 37 observations are presented below. According to Figure 1, since the value of computed F test statistic (6.416) was greater than the upper-tailed critical value of F (F 4.12) at significance level of p*=. 016 < =. 05, the null hypothesis one was rejected. Consequently, it was concluded that the level of use of ABC/ABM in business firms statistically influenced the reduction in the expected costs of new products before manufacturing. This conclusion was also supported by the Multiple Comparison procedures. The means of the aforementioned two groups were compared and the mean of the group "ABC/ABM were well established in their companies" (2.63) exceeded the mean of the other group that had "recently started to implement ABC/ABM" (1.59). See Table 5 in appendix A.[6]

Result Of Testing Null Hypothesis Number Two: Ho2:

Out of 34 participants who had "recently started to implement ABC/ABM", 5 did not respond to the question O_2 concerning hypothesis number two. Likewise, 2 out of 10 participants who stated that ABC/ABM had been well established in their companies left question O_2 unmarked. As a result, the ensuing statistical results were based on 37 observations.

The results of the ANOVA (One-Factor Between-Subjects Analysis of Variance) testing of the second null-hypothesis based on the above mentioned 37 observations are presented below in Figure 2. As can be seen, the result of the tests presented in Figure 2 indicated that the computed F ratio of 9.249 is greater than the upper tailed critical value of F (F 4.12) at significance level of p*=. 004 < =. 05. Thus, the null hypothesis two was also rejected. As a result, it was concluded that the level of use of ABC/ABM in business firms statistically influenced the reductions in the time required for new product introduction. This conclusion was also supported by the Multiple Comparison procedures when the mean of the group "ABC/ABM were well established in their companies" (2.63) exceeded the mean of the other group that had "recently started to implement ABC/ABM" (1.52). See Table 5 in appendix A.

Figure 1
Tests of Between – Subjects Effects
Independent Variable: Level of Use of ABC/ABM Tools
Dependent Variable: O_1
Summary of Statistical Decision[a] and Conclusion in Testing First Null Hypothesis
Using Univariate ANOVA. A 5% (.05) Significance Level

Source LVL of	SS	DF	MS	F Ratio	Critical Value of F	Significance Level or *p less than*	Statistical Decision
ABC	6.766	1	6.766	6.416	F (1,35)=4.12	.016	Ho: Rejected
Error	36.909	35	1.055				$H_{1:}$ Accepted
Corrected							
Total	**43.676**	**36**					
TOTAL	"N"	37					

a: 1. If value of F ratio is equal to or greater than it corresponding F_{crit}(critical value of F given degrees of freedom and significance level α =. 05), then the null hypothesis for F is rejected and the alternative hypothesis is accepted.
2. If value of F ratio is less than its F_{crit} value, then the decision is to fail or reject the null hypothesis and to not accept the Alternative hypothesis for that source of variance.[7]

Ho: Null hypothesis
H_1: Alternative hypothesis
SS: Sum of Squares
DF: Degrees of Freedom
MS: Mean Squared
$P^* <$ =.05
O_1 = Reductions in the expected costs of new products before manufacturing
F_{crit} = critical value of F

Figure 2
Tests of Between – Subjects Effects
Independent Variable: Level of Use of ABC/ABM Tools
Dependent Variable: O_2
Summary of Statistical Decision[a] and Conclusion in Testing Second Null Hypothesis
Using Univariate ANOVA. A 5% (.05) Significance Level

Source LVL of	SS	DF	MS	F Ratio	Critical Value of F	Significance Level or *p less than*	Statistical Decision
ABC	7.694	1	7.694	9.249	F (1,35)=4.12	.004	Ho: Rejected
Error	29.116	35	.832				$H_{1:}$ Accepted
Corrected							
Total	**36.811**	**36**					
TOTAL	"N"	37					

a: 1. If value of F ratio is equal to or greater than it corresponding F_{crit}(critical value of F given degrees of freedom and significance level α =. 05), then the null hypothesis for F is rejected and the alternative hypothesis is accepted.
2. If value of F ratio is less than its F_{crit} value, then the decision is to fail or reject the null hypothesis and to not accept the Alternative hypothesis for that source of variance.[7]

Ho: Null hypothesis
H_1: Alternative hypothesis
SS: Sum of Squares
DF: Degrees of Freedom
MS: Mean Squared
$P^* <$ =.05
O_2 = Reductions in the time required for new product introduction
F_{crit} = critical value of F

Result Of Testing Null Hypothesis Number Three: Ho3:

Out of 34 participants who had "recently started to implement ABC/ABM", 6 did not respond to the question O_3 concerning the hypothesis number three. Likewise, 4 out of 10 participants who stated that ABC/ABM had been well established in their companies left question O_3 unmarked. As a result, the ensuing statistical results were based on 34 observations.

The results of the ANOVA (One-Factor Between-Subjects Analysis of Variance) testing of the third null-hypothesis based on the above mentioned 34 observations are presented in Figure 3. The result of the tests presented in this Figure indicated that the computed F ratio of 11.794 greater than the upper tailed critical value of F (F 4.15) at significance level of p*=. 002 < =. 05. Thus, the null hypothesis 3 was also rejected. As a result, it was concluded that the level of use of ABC/ABM in business firms statistically influenced the reductions in the cost of purchased materials. This conclusion was also supported by the Multiple Comparison procedures when the mean of the group "ABC/ABM were well established in their companies" (2.83) exceeded the mean of the other group that had "recently started to implement ABC/ABM" (1.50). See Table 5 in appendix A.

Figure 3
Tests of Between – Subjects Effects
Independent Variable: Level of Use of ABC/ABM Tools
Dependent Variable: O_3
Summary of Statistical Decision[a] and Conclusion in Testing Third Null Hypothesis
Using Univariate ANOVA. A 5% (.05) Significance Level

Source	SS	DF	MS	F Ratio	Critical Value of F	Significance Level or *p less than*	Statistical Decision
LVLof ABC	8.784	1	8.784	11.794	F(1,32)=4.15	.002*	Ho: Rejected
Error	23.833	32	.745				$H_{1:}$ Accepted
Corrected Total	**32.618**	**33**					
TOTAL	"N"	34					

a: 1. If value of F ratio is equal to or greater than it corresponding F_{crit}(critical value of F given degrees of freedom and significance level α =. 05), then the null hypothesis for F is rejected and the alternative hypothesis is accepted.
2. If value of F ratio is less than its F_{crit} value, then the decision is to fail or reject the null hypothesis and to not accept the Alternative hypothesis for that source of variance.[7]

Ho: Null hypothesis
H_1: Alternative hypothesis
SS: Sum of Squares
DF: Degrees of Freedom
MS: Mean Squared
$P^* <$ =.05
O_3 = Reductions in the cost of purchased materials
F_{crit} = critical value of F

Result Of Testing Null Hypothesis Number Four: $Ho_{4:}$

Out of 34 participants who had "recently started to implement ABC/ABM", 4 did not respond to the question O_4 concerning the hypothesis number four. Likewise, 2 out of 10 participants who stated that ABC/ABM had been well established in their companies left question O_4 unmarked. As a result, the ensuing statistical results were based on 38 observations.

The results of the ANOVA (One-Factor Between-Subjects Analysis of Variance) testing of the fourth null-hypothesis based on the above mentioned 38 observations are presented in Figure 4. The result of the tests presented in this Figure indicated that the computed F ratio of 2.567 less than the upper tailed critical value of F (F 4.11) at significance level of p*=.118> =. 05. Thus, the null hypothesis four was not rejected. Consequently, it was concluded that the level of use of ABC/ABM in business firms statistically did not influence the reductions in the

manufacturing cost. This conclusion was also supported by the Multiple Comparison procedures when the mean of the group "ABC/ABM were well established in their companies" (2.75) was close to the mean of the other group that had "recently started to implement ABC/ABM" (2.07). See Table 5 in appendix A.

Figure 4
Tests of Between – Subjects Effects
Independent Variable: Level of Use of ABC/ABM Tools
Dependent Variable: O_4
Summary of Statistical Decision[a] and Conclusion in Testing Fourth Null Hypothesis
Using Univariate ANOVA. A 5% (.05) Significance Level

Source	SS	DF	MS	F Ratio	Critical Value of F	Significance Level or *p less than*	Statistical Decision
LVL of ABC	2.949	1	2.949	2.567	F(1,36)=4.11	.118*	Ho: was accepted
Error	41.367	36	1.149				$H_{1:}$ Rejected
Corrected Total	**44.3316**	**37**					
TOTAL	"N"	38					

a: 1. If value of F ratio is equal to or greater than it corresponding F_{crit}(critical value of F given degrees of freedom and significance level α =. 05), then the null hypothesis for F is rejected and the alternative hypothesis is accepted.
2. If value of F ratio is less than its F_{crit} value, then the decision is to fail or reject the null hypothesis and to not accept the Alternative hypothesis for that source of variance.[7]

Ho: Null hypothesis
H_1: Alternative hypothesis
SS: Sum of Squares
DF: Degrees of Freedom
MS: Mean Squared
$P^* <$ =.05
O_4 = Reductions in the manufacturing cost
F_{crit} = critical value of F

Result Of Testing Null Hypothesis Number Five: Ho_5

Out of 34 participants who had "recently started to implement ABC/ABM", 5 did not respond to the question O_5 concerning the hypothesis number five. Likewise, 2 out of 10 participants who stated that ABC/ABM had been well established in their companies left question O_5 unmarked. As a result, the ensuing statistical results were based on 37 observations.

The results of the ANOVA (One-Factor Between-Subjects Analysis of Variance) testing of the fifth null-hypothesis based on the above mentioned 37 observations are presented in Figure 5. According to this Figure, the computed F ratio of 5.013 was greater than the upper tailed critical value of F (F 4.12) at significance level of p*=.032< =. 05which suggested the rejection of the null hypothesis five. As a result, it was concluded that the level of use of ABC/ABM in business firms statistically influenced the development of more profitable products by participating companies. This conclusion was also supported by the Multiple Comparison procedures when the mean of the group "ABC/ABM were well established in their companies" (2.75) was greater than the mean of the other group that had "recently started to implement ABC/ABM" (1.93). See Table 5 in appendix A.

Figure 5
Tests of Between – Subjects Effects
Independent Variable: Level of Use of ABC/ABM Tools
Dependent Variable: O_5
Summary of Statistical Decision[a] and Conclusion in Testing Fifth Null Hypothesis
Using Univariate ANOVA. A 5% (.05) Significance Level

Source	SS	DF	MS	F Ratio	Critical Value of F	Significance Level or *p less than*	Statistical Decision
LVL of ABC	4.205	1	4.205	5.013	F(1,35)=4.12	.032*	Ho: Rejected
Error	29.362	35	.839				$H_{1:}$ Accepted
Corrected Total	**33.568**	**36**					
TOTAL	"N"	37					

a: 1. If value of F ratio is equal to or greater than it corresponding F_{crit}(critical value of F given degrees of freedom and significance level α =. 05), then the null hypothesis for F is rejected and the alternative hypothesis is accepted.
2. If value of F ratio is less than its F_{crit} value, then the decision is to fail or reject the null hypothesis and to not accept the Alternative hypothesis for that source of variance.[7]

Ho: Null hypothesis
H_1: Alternative hypothesis
SS: Sum of Squares
DF: Degrees of Freedom
MS: Mean Squared
$P^* <$ =.05
O_5 = Developments of more profitable products
F_{crit} = critical value of F

Result Of Testing Null Hypothesis Number Six: Ho_6

Out of 34 participants who had "recently started to implement ABC/ABM", 8 did not respond to the question O_6 concerning the hypothesis number six. Likewise, 2 out of 10 participants who stated that ABC/ABM had been well established in their companies left question O_6 unmarked. As a result, the ensuing statistical results were based on 34 observations.

The results of the ANOVA (One-Factor Between-Subjects Analysis of Variance) testing of the sixth null-hypothesis based on the above mentioned 34 observations are presented in Figure 6. According to this Figure, the computed F ratio of 1.39 was less than the upper tailed critical value of F (F 4.15) at significance level of p*=. 247> =0.05, which did not suggest the rejection of the null hypothesis 6. As a result, it was concluded that the level of use of ABC/ABM in business firms did not statistically influence the reductions in the number of design change after production begins. This conclusion was also supported by the Multiple Comparison procedures when the mean of the group "ABC/ABM were well established in their companies" (2.25) was close to the mean of the other group that had "recently started to implement ABC/ABM" (1.81). See table 5 in appendix A.

Figure 6
Tests of Between – Subjects Effects
Independent Variable: Level of Use of ABC/ABM Tools
Dependent Variable: O_6
Summary of Statistical Decision[a] and Conclusion in Testing Sixth Null Hypothesis
Using Univariate ANOVA. A 5% (.05) Significance Level

Source	SS	DF	MS	F Ratio	Critical Value of F	Significance Level or *p less than*	Statistical Decision
LVL of ABC	1.197	1	1.197	1.391	F (1,32)=4.15	.247	Ho: Do not reject (i.e. Ho: was accepted)
Error	27.538	32	.861				Hi: Rejected
Corrected Total	**28.735**	**33**					
TOTAL	"N"	34					

a: 1. If value of F ratio is equal to or greater than it corresponding F_{crit}(critical value of F given degrees of freedom and significance level α =. 05), then the null hypothesis for F is rejected and the alternative hypothesis is accepted.
2. If value of F ratio is less than its F_{crit} value, then the decision is to fail or reject the null hypothesis and to not accept the Alternative hypothesis for that source of variance.[7]

Ho: Null hypothesis
H_1: Alternative hypothesis
SS: Sum of Squares
DF: Degrees of Freedom
MS: Mean Squared
$P^* <$ =.05
O_6 = Reductions in the number of design changes after production
F_{crit} = critical value of F

Result Of Testing Null Hypothesis Number Seven: Ho_7

Out of 34 participants who had "recently started to implement ABC/ABM", 4 did not respond to the question O_7 concerning the hypothesis number seven. Likewise, 2 out of 10 participants who stated that ABC/ABM had been well established in their companies left question O_7 unmarked. As a result, the ensuing statistical results were based on 38 observations.

The results of the ANOVA (One-Factor Between-Subjects Analysis of Variance) testing of the seventh null-hypothesis based on the above mentioned 38 observations are presented in Figure 7. According to this Figure, the computed F ratio of 2.909 was less than the upper tailed critical value of F (F 4.11) at significance level of p*=. 097> =0.05, which did not suggest the rejection of the null hypothesis seven. As a result, it was concluded that the level of use of ABC/ABM in business firms did not statistically influence the improvement of the companies over all profitability. This conclusion was supported also by the Multiple Comparison procedures when the mean of the group that "ABC/ABM were well established in their companies" (2.75) was very close to the mean of the other group that had "recently started to implement ABC/ABM" (2.23). See Table 5 in appendix A.

Figure 7
Tests of Between – Subjects Effects
Independent Variable: Level of Use of ABC/ABM Tools
Dependent Variable: O_7
Summary of Statistical Decision[a] and Conclusion in Testing Sixth Null Hypothesis
Using Univariate ANOVA. A 5% (.05) Significance Level

Source	SS	DF	MS	F Ratio	Critical Value of F	Significance Level or *p less than*	Statistical Decision
LVL of ABC	1.686	1	1.686	2.909	F (1,36)=4.11	.097	Ho: Do not reject (I.e. Ho: was accepted)
Error	20.867	36	.580				Hi: Rejected
Corrected Total	**22.553**	**37**					
TOTAL	**"N"**	**38**					

a: 1. If value of F ratio is equal to or greater than it corresponding F_{crit}(critical value of F given degrees of freedom and significance level α =. 05), then the null hypothesis for F is rejected and the alternative hypothesis is accepted.
2. If value of F ratio is less than its F_{crit} value, then the decision is to fail or reject the null hypothesis and to not accept the Alternative hypothesis for that source of variance.[7]

Ho: Null hypothesis
H_1: Alternative hypothesis
SS: Sum of Squares
DF: Degrees of Freedom
MS: Mean Squared
$P^* <$ =.05
O_7 = Improved overall profitability
F_{crit} = critical value of F

O_7= Improved overall profitability
F_{crit}= critical value of F

Testing The Sub-Null Hypotheses

In testing the sub-null hypotheses, the level of use of ABC/ABM was considered as a variable **depending** on other **independent** variables such as: (a) the company's dollar sales, (b) the company's number of employees, and (c) the company's primary operations. Then, the ANOVA test was applied. If the result of the ANOVA test was statistically significant, the null hypothesis was rejected indicating that the dollar sales, number of employees, and/or primary operations of the participating companies statistically influenced the level of use of ABC/ABM.

Result Of Testing Sub-Null Hypothesis Number One: Ho_1: Size Of Firm And The Frequency Use Of Abc/Abm

SHo_1: There is no statistically significant difference between the size of firm ($ Sales Volume) and the level of use of ABC/ABM tools in business firms.

The Univariate Analysis of Variance test for size of firm resulted in rejection of the sub null hypothesis. This decision was reached because the computed value of F test statistic (8.174) was greater than the upper-tailed critical value of F (F= 3.817) at significance level p*=. 005 < =. 05 (Figure 8).

Consequently, it was concluded that the size of the firm, measured in terms of dollar sales, influenced the level of use of ABC/ABM by the participating companies. In other words, firms with higher dollar sales used the ABC/ABM techniques more extensively.

Figure 8
Tests of Between – Subjects Effects
Dependent Variable: Level of Use of ABC/ABM Tools
Independent Variable: D
Summary of Statistical Decision[a] and Conclusion in Testing First Null Hypothesis
Using Univariate ANOVA. A 5% (.05) Significance Level

Source	SS	DF	MS	F Ratio	Critical Value of F	Significance Level or *p less than*	Statistical Decision
D	19.572	1	19.572	8.174	F (1,83)=3.817	.005*	Ho: Rejected
Error	198.734	83	2.394				$H_{1:}$ Accepted
Corrected Total	**218.306**	**84**					

a: 1. If value of F ratio is equal to or greater than it corresponding F_{crit}(critical value of F given degrees of freedom and significance level α =. 05), then the null hypothesis for F is rejected and the alternative hypothesis is accepted.
2. If value of F ratio is less than its F_{crit} value, then the decision is to fail or reject the null hypothesis and to not accept the Alternative hypothesis for that source of variance.[7]

Ho: Null hypothesis
H_1: Alternative hypothesis
SS: Sum of Squares
DF: Degrees of Freedom
MS: Mean Squared
P^* < =.05
D = Size of firm
F_{crit} = critical value of F

RESULT OF TESTING SUB- NULL HYPOTHESIS NUMBER TWO: Ho_2: …Company's Number Of Employees And The Frequency Use Of ABC/ABM

SHo_2: There is no statistically significant difference between the company's number of employees and the level of use of ABC/ABM in business firms.

The Univariate Analysis of Variance test for the influence of the company's number of employees on the level of use of ABC/ABM showed a high value for the computed F test statistic (8.087) compared with the table F value of 3.034 at significance level p*=. 001 < =. 05 (Figure 9). This high value indicated that the level of use of ABC/ABM was statistically related to the company's number of employees. Consequently, it suggested the rejection of the sub null hypothesis Sho_2.

Figure 9
Tests of Between – Subjects Effects
Dependent Variable: Level of Use of ABC/ABM Tools
Independent Variable: C
Summary of Statistical Decision[a] and Conclusion in Testing Second Null Hypothesis
Using Univariate ANOVA. A 5% (.05) Significance Level

Source	SS	DF	MS	F Ratio	Critical Value of F	Significance Level or *p less than*	Statistical Decision
C	35.966	2	17.983	8.087	F(2,82)=3.034	.001*	Ho: Rejected
Error	182.340	82	2.224				H_1: Accepted
Corrected Total	**218.306**	**84**					

a: 1. If value of F ratio is equal to or greater than it corresponding F_{crit}(critical value of F given degrees of freedom and significance level α =. 05), then the null hypothesis for F is rejected and the alternative hypothesis is accepted.
2. If value of F ratio is less than its F_{crit} value, then the decision is to fail or reject the null hypothesis and to not accept the Alternative hypothesis for that source of variance.[7]

Ho: Null hypothesis
H_1: Alternative hypothesis
SS: Sum of Squares
DF: Degrees of Freedom
MS: Mean Squared
P^* < =.05
C = Company's number of employees
F_{crit} = critical value of F

Result Of Testing Sub-Null Hypothesis Number Three: Ho_3: …Company's Primary Operation Group And The Frequency Use Of Abc/Abm

SHo_3: There is no statistically significant difference between the company's primary operation and the level of use of ABC and/or ABM in business firms.

The Univariate Analysis of Variance test was used to test the third sub null hypothesis SHo_3. The results of the test as shown in Figure 10 indicated that the computed value of F test ratio (1.973) compared with the critical value of F (F=1.838) at significance level of p*=. 039 < =. 05. Such a result directed us to reject this sub null hypothesis, which implies that the primary operations (such as service, food, pharmaceuticals, oil, chemicals, rubber, glass, machinery, steel, telecommunications, etc.) of companies had some influence on the level of the use of ABC/ABM by those companies.

Figure 10
Tests of Between – Subjects Effects
Dependent Variable: Level of Use of ABC/ABM Tools
Independent Variable: A
Summary of Statistical Decision[a] and Conclusion in Testing Third Null Hypothesis
Using Univariate ANOVA. A 5% (.05) Significance Level

Source	SS	DF	MS	F Ratio	Critical Value of F	Significance Level or *p less than*	Statistical Decision
A	4.501	12	4.501	1.973	F(12,72)=1.838	.039*	Ho: Rejected
Error	2.282	72	2.282				$H_{1:}$ Accepted
Corrected Total	**6.783**	**84**					

a: 1. If value of F ratio is equal to or greater than it corresponding F_{crit}(critical value of F given degrees of freedom and significance level α =. 05), then the null hypothesis for F is rejected and the alternative hypothesis is accepted.
2. If value of F ratio is less than its F_{crit} value, then the decision is to fail or reject the null hypothesis and to not accept the Alternative hypothesis for that source of variance.[7]

Ho: Null hypothesis
H_1: Alternative hypothesis
SS: Sum of Squares
DF: Degrees of Freedom
MS: Mean Squared
$P^* <$ =.05
A = Company's primary operation
F_{crit} = critical value of F

Discussion And Conclusions

This paper examined the extent to which some of the largest corporations in the USA have used the ABC/ABM models in their operations and for their decision-making purposes. It was intended in this research to explore and examine empirically the usefulness of the models and the factors that could influence their success or failure. The research is a follow up on the previous studies conducted in this area. For instance, Robin Cooper and Robert Kaplan, the founders of ABC/ABM, reported among their principal findings in the study of eight companies, "ABC management benefits both strategic and operational decisions". They further reported, "ABC information, by itself, does not invoke actions and decisions leading to improve profits and operating performance. Management must institute a conscious process of organizational change." [8]

By analyzing the outcome of 85 participants in the study, we were able to test our hypotheses regarding the level of use of ABC/ABM models and its influence on the operational benefits expected to be received by applying the models. Our results showed statistically positive relationships between the level of use of the models, on one hand, and the reduction in expected costs of new products before manufacturing, the reduction in the cost of purchased materials, the reduction in the cost of development of more profitable products, and the reduction in the time required for new product introduction**.** Positive relationships, however, were not observed between the level of use of the models and reduction in manufacturing costs, number of design change after production began, and improvement in the overall profitability of the participating companies. Combing all the stated benefits expected from the application of the models, nonetheless, our study did not show a significantly high score.

The study also showed that the size of firms in terms of total dollar sales, number of employees, and company's primary operations had statistically significant influenced on the level of use of the models.

In regard to difficulties and obstacles in applying the models, the study revealed several factors. The important factors were: inadequacy of management support, unwillingness of people to change, lack of adequate personnel, complexity in process design, extended time in implementing the systems, complexity in plant layout, complexity in product design, and inadequate returns from expenditures on these models. See Tables 6&6a in Appendix B[9.]

Endnotes

Our study had some limitations and our conclusions are based on a feedback received from 85 controllers/managers of the fortune largest 500 USA Corporations participated in the study. Among the 85 participants only 44 companies had used the models in their operations. Among them, 10 companies stated that the application of the models had been well established in their operations. The remaining 34 companies were recently started to implement the models and did no have chance to fully implement them.

It is expected that the outcomes will be different after more companies, large and medium size, have applied the models more extensively. Since ABC/ABM models are being used to some extent by companies in practice, we recommend that colleges and universities continue to include coverage of these models in their curricula. However, we recommend that further study be performed regarding the benefits and shortcomings of the models after being applied extensively by more companies. 🕮

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Appendix A

Table 5
Mean of Group Who Recently Had Started To Implement ABC/ABM
In Regard To Hypotheses One To Seven (O1 To O7)

Number of Participants	Hypothesis 1 O1	Hypothesis 2 O2	Hypothesis 3 O3	Hypothesis 4 O4	Hypothesis 5 O5	Hypothesis 6 O6	Hypothesis 7 O7
1				4			3
2	1	1	1	4	1	1	2
3	1	1	1	2	2	2	2
4							
5	1	1	1	1	1	1	3
6	4	1	3	4	4	3	4
7							
8	3	3	3	3	3	2	3
9	1	2	2	2	2	1	2
10	1	1	2	1	2	1	2
11	1	2	1	2	2	2	2
12	1	2	1	1	2	2	2
13	1	1	2	2	1	2	2
14	1	1	1	1	1	1	2
15	1	1	1	1	1	1	2
16	1	1	1	1	1	1	1
17	1	1		2	2	1	2
18	1	1	1	2	2	1	2
19	3	4	3	3	4	3	4
20	2	2	1	3	2	2	2
21	2	2	1	2	2	2	2
22							
23	2	2	1	2	2	2	2
24	2	1	1	1	2	2	2
25	2	2	1	2	2	2	2
26	2	2	2	2	3	3	2
27	1	1	2	2			2
28	2	2	1	2	2	2	2
29	2	1	1	2	1	2	2
30	1	1	2	1	2		2
31					3		
32	1	1	2	2	1		2
33	1	2	2	2	1	2	3
34	3	1	1	3	2	3	2
	---	---	---	---	---	---	---
SUM	46	44	42	62	56	47	67
N	29	29	28	30	29	26	30
MEAN	**1.59**	**1.52**	**1.50**	**2.07**	**1.93**	**1.81**	**2.23**

Mean of Group That ABC/ABM Was Well Established In Their Companies In Regard to Hypotheses One to Seven (O1 to O7)

Number of Participants	Hypothesis 1 O1	Hypothesis 2 O2	Hypothesis 3 O3	Hypothesis 4 O4	Hypothesis 5 O5	Hypothesis 6 O6	Hypothesis 7 O7
1	5	4	4	5	4	4	4
2	1	1		3	2	1	2
3							
4	5	5	5	5	5	5	5
5	1	1	3	1	2	1	3
6	2	2		1	2	1	2
7	3	3	2	2	3	2	2
8	2	3	2	2	2	2	2
9	2	2	1	3	2	2	2
10							
	---	---	---	---	---	---	---
SUM	21	21	17	22	22	18	22
N	8	8	6	8	8	8	8
MEAN	**2.63**	**2.63**	**2.83**	**2.75**	**2.75**	**2.25**	**2.75**

Appendix B

Table 6

		DEGREE OF IMPORTANCE 1 – Not Important 2 – Somewhat Important 3 – Moderate Important 4 – Fairly Important 5 – Very Important				
Factors Influenced Not to Implement ABC and/or ABM	**Respondents**	**1**	**2**	**3**	**4**	**5**
Did not get top management sponsorship/support	33	2	2	6	13	10
Lack of familiarity with ABC/ABM	30	6	5	6	11	2
People unwilling to change	26	4	4	10	7	1
The accounting/information system does not support ABC/ABM	13	2	1	3	3	4
Cross-functional cooperation is difficult to get	12	3	3	3	1	2
Do not have resources to implement	12	1	1	6	2	2
Perception that ABC/ABM is a passing fad	14	5	2	3	2	2
ABC/ABM is not relevant for our kind of business	11	4	2	3	1	1

Table 6a

Factors Influenced Not to Implement ABC and/or ABM	Total Score	Average	Rank
Did not get top management sponsorship/support	126	3.82	1
Cross-functional cooperation is difficult to get	42	3.50	2
The accounting/information system does not support ABC/ABM	45	3.46	3
Do not have resources to implement	39	3.25	4
Lack of familiarity with ABC/ABM	88	2.93	5
People unwilling to change	75	2.88	6
Perception that ABC/ABM is a passing fad	36	2.57	7
ABC/ABM is not relevant for our kind of business	26	2.36	8

Notes