

IMPLEMENTATION OF ACTIVITY BASED COSTING IN YEMENI MANUFACTURING COMPANIES

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ABSTRACT. The study attempts to investigate the status of ABC among Yemeni firms and reveal factors that are related to the adoption using 50 manufacturing companies. Analysis includes descriptive statistics and logistic regression analysis that applied to test the variables relationship in determining the adoption of ABC.

The results reveal that 24 percent of Yemeni manufacturing companies are implementing ABC. Moreover, among the variables used in this study, only top management support and non-accounting ownership found to be significant to ABC implementation among the studied sample. Finally, the results indicate that the less complexity in products, no intensity of competition, and lack of internal resources to operate ABC are the common reasons of non-ABC adopter.

1. INTRODUCTION

Nowadays, manufacturing organizations are much more complex than those of the last century because they spread around the world. To manage these manufacturing organizations, managers require information which is relevant,

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2020 *Mathematics Subject Classification.* 00A69.

Submitted: 03.03.2021; *Accepted:* 20.03.2021; *Published:* 30.03.2021.

accurate and readily available. Information is needed to formulate and operationalize functional strategies and to make decisions on product mix and production costs. Although production systems have changed to meet the changing needs of the marketplace, in many organizations the internal management accounting systems and information systems have remained unchanged. Managers and accountants have become dissatisfied with traditional costing systems and have expressed concerns about their suitability in the modern manufacturing environment.

Activity based costing (ABC) has emerged as an alternative to traditional costing systems. It was developed in the USA by Harvard Business School Professors Kaplan and Cooper and is a process of individually listing and measuring the cost of each activity contributing to the production and delivery of a particular product or service (Gosselin, 1997). Research to date has identified the most important areas of application of activity-based information among adopters of ABC as understanding cost behavior, measuring cost accuracy (Alsaeed, 2005), cost reduction (Kiani and Sangeladji, 2003), cost management (Innes and Mitchell, 2000), improve profitability (Krumwiede and Charles, 2014; Al-Qudah1 and Al-Hroot, 2017), product/service pricing (Pierce and Brown, 2003). Although these surveys specifically addressed ABC, it is clear from the range of applications that the reported uses of activity-based data go well beyond more accurate costing.

Albeit of the vast benefits from implementing ABC, its adoption status is very low in developed countries such as the UK (Innes and Mitchell, 2000). The adoption of ABC is still in infancy stage in developing countries (ElGammal, et al, 2016). Therefore, the attempts to investigate the development of ABC among Yemeni manufacturing firms and reveal factors that are related to the adoption of ABC in Yemen. the study is organized into five sections. Second section discusses the literature review of ABC implementation. The methodology is explained in the third section. Findings and discussions will be in the fourth section before conclusion and limitation in the last section.

2. LITERATURE REVIEW

ABC adoption rate

ABC is a costing system whereby costs are accumulated in accordance to activities. This system differs from the traditional system which accumulated costs by functional basis, i.e. departmental basis (Atkinson, Banker, Kaplan, and Young, 2001). For example, in traditional cost system, costs are accumulated at the cost centers (production and services departments), whereas in ABC system costs are accumulated by activities (set up and run machine). ABC has helped many manufacturing and service organizations to improve their competitiveness by enabling them to make decisions based on a better understanding of their cost assessment (Raz and Elnathan, 1999; Yapa and Kongchan, 2012). However, despite of the advantages of ABC, adoption rates revealed by studies show that companies practice of ABC have been lower than what has been expected, and there has been no visible upward trend. This is observed from the results of some of the earlier surveys as shown in Table 2.1.

Innes and Mitchell (2000) provided a comprehensive set of findings regarding the existing scale of ABC adoption and the trend in adoption rates over the period. Based on a similar sample of the largest UK manufacturing service and finance companies, the studies showed the ABC adoption was 17.5 percent and the proportion of companies currently considering ABC adoption was 20.3 percent. Similarly, Cotton et al. (2003) reported that the adoption rate for New Zealand manufacturing firms slightly higher than those reported in the UK. The adoption of ABC was fluctuated in Ireland, Clarke (1992) who surveyed 320 large manufacturing companies found that 14 percent of respondents had implemented ABC and a further 34 percent intended to do so within the next two years. However, Pierce and Brown (2004) found that 27.9 percent of respondents had implemented ABC and only 9 percent assessing ABC.

However, some surveys found high adoption rate of ABC adoption compared with above surveys. For example, survey findings from US companies showed that 51.7 percent of responding manufacturing companies had implemented ABC (Kiani and Sangeladji, 2003). Similarly in Malaysia, the survey of Maelah and Ibrahim (2006) found 36.11 percent of Malaysian manufacturing companies implementing ABC. Similarly, (Al saeed, 2005), and Rundora et al (2013)

found the adoption rates of 33.3 percent for Saudi and South Africa manufacturing firms respectively.

Factors Relating To The Adoption Of ABC

Krumwiede (1998) surveyed U.S. manufacturing firms to study how contextual factors, such as the potential for cost distortion or size of firms; and organizational factors, such as top management support, training or non-accounting ownership, affect each stage of the ABC implementation process. He found that the different factors affected the various stages of implementation of ABC and the degree of importance of each factor varies according to the stage of implementation. He concludes that firms considering or implementing the ABC system should take organizational and contextual factors into account. Therefore, the study focuses on both organizational (size, top management support, and non-accounting ownership) and technological factors (IT, and product diversity) that might relate to the implementation of ABC.

Firm size has remained one of the most controversial influencing factors in the diffusion literature since most practical investigations of the influence of size on diffusion of innovation have produced mixed results (Damanpour, 1992; Dewar and Dutton, 1986; Hage, 1980). Brown (1981) argued that one of the advantages of large firms is their greater ability to afford capital, to put up with the costs of innovation and bear the risk of failure. With regard of ABC, several studies have been conducted to investigate the relation between its implementation with the firm size. They found that adoption rates for large companies were significantly higher than for small companies because these firms are better candidate for the use of ABC and they have more complex operations, various products, and large overhead (Alsaeed, 2005; and Krumwied, 1998). However, some argue that the small firms have several advantages over larger firms in the adoption of an innovation such as less bureaucracy, greater motivation better survey of the entirety of the project, and greater proximity to the market (Nooteboom, 1994). On the other hand, Ismail and Mahmoud (2012) and Arora and Raju (2017) found no significant evidence of a strong relationship between diffusion stages of ABC and organizations' size. The study uses number of employees as measurement of firm's size.

B. Top Management Support

Top management support for ABC is vital because that the management is able to determine goals, strategies and resources (such as capital, time and competence), and to prepare the support necessary to activate employees to use ABC (Shields and McEwen, 1996). Top management also has a key role to use ABC information in communications with other employees to encourage them to utilize ABC information. Innes and Mitchell (2000), and Kiani and Sangeladji (2003) found that the top management support and unwilling to change are most challenge factors for ABC adopters. According to Majid and Sulaiman (2008) and Fadzil and Rababa, (2012) the most essential factor influencing the successful implementation of ABC is top management support, and the most firms who abandoning ABC because of lower top-management support. However, ElGammal, et al, (2016) found that top management's support is not an essential factor to implement ABC. The study uses the level of management support to measure Top Management Support toward ABC.

C. Non-Accounting Ownership

Non-accounting background ownership, the commitment of individuals or groups who are not accountants to use ABC information, is an important determinant of the success of ABC because ABC can provide essential economic information not only for accountants but, for people throughout the company. It activates employees or managers to accept and implement more ABC information. Non-accounting ownership is also the consequence of top management support for ABC, linkage of ABC to competitive strategies and linkage of ABC to performance evaluation and compensation, as well as training in using ABC (Shields, 1995). Whenever non-accountants (such as operating employees, design engineers or top executives) are not committed to use ABC information, the implementation of ABC is ineffectual (Maelah and Ibrahim, 2006; Fadzil and Rababa, 2012). The level of non-accounting ownership towards ABC uses as a measure for this variable.

D. Information Technology

Askarany and Smith (2003) indicated that there is a significant relationship between technological changes in manufacturing practices and changes in cost and management accounting techniques. Similarly, Majid and Sulaiman (2008)

pointed out one of the important factors that help to reach the usage stage of ABC is information technology. When information technology of a company has the good subsystem integration, user-friendly, availability of detailed information, the variety of cost data, and timeliness of the information provided, ABC implementation will be much easier (Fadzil and Rababa, 2012; ElGammal, et al, 2016). However, Anderson (1995) pointed out that managers who were satisfied with information provided from existing system might be reluctant to invest their resources in ABC, and found evidence that the quality of IT is negatively related to management's evaluation of overall value of ABC. Finally, Al- Omiri and Drury (2007) found that the IT quality is not significant for ABC adoption. The quality of existing IT in the organization uses to measure this variable in the study.

F. Product Diversity

Production diversity relates to the variety of type and/or volume of products and/or product lines that are manufactured by a firm. Stated differently, products are defined divertible if they consume activities in different proportions (Gunasekaran, Marri, and Yusuf, 1999). Early ABC studies argued that traditional costing methods, in view of diverse products, are incapable for accurately tracing a large number of individual costs and, in turn, leading to distorted costing and pricing decisions (Cooper and Kaplan, 1988). In contrast, Bjornenak (1997), Tsai and Jhong (2019) and found a positive relationship between the diversity of products and the tendency to adopt ABC. Brierley (2008) found no relationship between them. The study uses the numbers of product to measure the product diversity.

3. METHODOLOGY

For any survey, the most important issues are the selection of the survey population and the sample size. The population and the sample size for this study are both defined as the top 100 Yemeni manufacturing firms as ranked in Yemeni chamber, December 13, 2016. The study adopted questionnaire as an approach for the purpose of data collection which adopted from studies conducted by Krumweide (1998).

To measure the variables of the study, both the nominal and interval scales are used. Nominal scale qualitatively distinguishes groups by categorizing them into

mutually exclusive and collectively exhaustive sets. In the questionnaire, the nominal scale is used to capture respondents' and organizations' background. The information that can be generated from nominal scaling is to calculate the percentage, frequency, mean, and standard deviation of the data. On the other hand, the interval scale is used to capture the significance of independent variables for each variable, the questionnaire lists at least three statements and the composite score is used to represent each variable. Table 3.1 summarizes the definitions of independent variables.

TABLE 1. SUMMARY OF INDEPENDENT VARIABLE DEFINITIONS

Variable	Definition
Size	Number of employess
Top Management*	Level of top management support
Non Accounting*	Level of non-accounting ownership towards ABC
IT*	Quality of existing IT in the organization
Product Diversity	Number of Products

H1. There is a positive effect of knowledge sharing on organizational performance.

Note: * Composite score of five point Likert scale is used to operationalise the variables.

Analysis includes descriptive statistics, reliability, factor analysis, and logistic regression analysis. Descriptive analysis is used to show status of ABC adopters among Yemeni firms. Finally, logistic regression is applied to test the variables relationship in determining the adoption of ABC.

4. RESULTS AND DISCUSSION

Descriptive Statistics

Table 4.1 shows 75 percent (9 of 12) and 71 percent (27 of 38) are categorized with large size firms (more than 200 Employees) for both ABC adopter and non-adopters firms, respectively. With regards to product diversity, 50 percent

TABLE 2. ABC ADOPTION WITH CATEGORICAL VARIABLES (N=50)

						Size	Product Diversity
		Less 200	Above 20	1 %	Less 10	Above 11	%
ABC Adoption	Yes	3 (25%)	9 (75 %)	100%	6 (50%)	6 (50%)	100%
	No	11 (29%)	27 (71%)	100%	17(45%)	21 (55%)	100%

(6 Of 12) of adopter firms are categorized under more product diversity (more than 11 products), while the non-adopters counted for 55 percent (21 of 38).

Regression Analysis

Pearson's correlation coefficient used to measure linear association among independent variables. Table 4.2 present the correlation matrix among the variables tested in the model. The lowest correlation coefficient is 0.001 and the highest is 0.41. Thus, Multicollinearity is not a problem in this study.

TABLE 3. PEARSON'S CORRELATIONS (N=50)

	Size	Product	TopMgt	Non-Actg	IT
Size	1				
Product	-.039	1			
TopMgt	-.173	-.125	1		
Non-Actg	.001	-.321(*)	.120	1	
IT	.092	-.320(*)	.317(*)	.408(**)	1

* Correlation is significant at the 0.05 level (1-tailed).

** Correlation is significant at the 0.01 level (1-tailed)

Binary logistic regression that has been used in the study is a type of regression analysis where the dependent variable is a dichotomy variable: coded 1(ABC adopters) or 0 (ABC non-adopter). In the logistic regression analysis, the classification table, in Table 4.3 shows that the ABC Adoption model is able to predict accurately at 88%.

TABLE 4. CLASSIFICATION TABLE*(N=50)

Observed		ABC adoption	Percentage Correct		
			Yes	No	
Step 1	ABC adoption	Yes	9	3	75.0
		No	3	35	92.1
	Overall Percentage				88.0

*The cut value is .500

The Hosmer and Lemeshow Goodness-of-Fit Test divides subjects into deciles based on predicted probabilities, and then computes a chi-square from observed and expected frequencies. The p-value of 0.985 (insignificant = fail to reject null hypothesis) indicates that the logistic model has a good fit to the data.

The value of Cox-Snell R Square and the Nagelkerke R Square (0.47, and 0.71, respectively) show that there is a moderate relationship between independent variables and dependent variable.

TABLE 5. VARIABLES IN THE EQUATION (N=50)

Variables	B	S.E.	Wald	df	Sig.	Exp(B)
X1	.596	1.228	.235	1	.628	1.815
X2	1.798	1.261	2.033	1	.154	6.039
X3	1.563	.651	5.760	1	.016*	4.773
X4	1.608	.581	7.661	1	.006*	4.993
X5	.170	.254	.450	1	.502	1.185
Constant	-50.955	16.484	9.555	1	.002	.000

*= P<0.05

Summary model: -2 Log likelihood = 22.697; Cox & Snell R Square = .477; Nagelkerke R Square = .714

Hosmer and Lemeshow Test: Chi-square = 1.865; df = 8; Sig. = .985

Based on the above findings in Table 4.4, the proposed logistic regression is now expressed as follow:

$$\text{Logit (adopters)} = .002 + 1.815(X1) + 6.039(X2) + 4.773(X3) + 4.993(X4) + 1.185(X5)$$

Where:

Logit (adopters) = The probability of ABC adoption (adoption 1, not adoption 0)

X1 = Firm Size (1 less than 200, 2 above than 201 employees)

X2 = Product Diversity (1 less than 10, 2 above than 11 products)

X3 = Top Management Support

X4 = Non Accounting Ownership

X5 = Information Technology.

The findings in Table 4.4 suggest that all variables are positively associated with ABC adoption at unit with an increase in odds log of ABC adoption by 0.596, 1.798, 1.563, 1.608, and 0.170, for X1, X2, X3, X4, and X5 respectively. However, not all of these associations are significant. Only two variables, i.e. top management support and non-accounting ownership are found to be statically significant with ABC adoption at $p < 0.05$. The firm size, IT and product diversity are not statistically significant with ABC adoption among Yemeni manufacturing firms.

Top management support is the first factor found to have a significant positive influence on the adoption of ABC. This finding is in line with Fadzil and Rababa, (2012) which reported that the essential and key factor influencing the success of implementing ABC is top management support. The rational for this finding is that the support of top management provides all necessary facilities and recourses to implant ABC which will provide, in turn, accurate information for better decision and good communication with others in the company. Moreover, the finding of positive relationship between non-accounting ownership and implementation for Yemeni companies is in line with (Maelah and Ibrahim, 2006; and Fadzil and Rababa, 2012). The reason is that the implementation will be more efficient when all staff involved because all of them (not only accountant) will get benefits of successful implementation. Therefore, the successful adoption of ABC for Yemeni manufacturing companies must obtain the top management support and make sure that the non-accountant staff are effectively involved in ABC adoption.

However, the study found the firm size is not significantly associated with ABC adoption, this finding is consist with Arora and Raju (2017) who found no significant evidence of a strong relationship between the adoption of ABC and firms' size. Moreover, in consist with Brierley (2008) the study found no

relationship between ABC adoption and product diversity. Finally, in line with the findings of Al- Omiri and Drury (2007), the study found that the IT quality is not significant for ABC adoption.

5. CONCLUSION

The study provides empirical evidence on the status of ABC adoption among manufacturing organizations in Yemen that participated in the survey. The study suggests that organizations in Yemen still use the traditional method of overhead costing, instead of the ABC. Specifically, the present study uses certain factors (organizational and technological) derived from previous researches conducted in other countries such as US, UK, Malaysia, Arab Saudi, and Australia. The results indicate that the top management support and non-accounting ownership are positively associated with the adoption of ABC. However, the study did not find evidence on the relationship between firm size, product diversity, and IT and ABC adoption. Finally, it is recommended to investigate the implication of ABC in Yemen for different industries and the influence of ABC on the completion and companies' performance.

REFERENCES

- [1] AL-OMIRI, M., DRURY, C., (2007): *A survey of factors influencing the choice of product costing systems in UK organizations*, Management Accounting Research, **18** (2007), 399-424.
- [2] AL-QUDAH, L. AND AL-HROOT, Y. (2017): *The Implementing Activity-based Costing Technique and Its Impact on Profitability: A Study of Listed Manufacturing Companies in Jordan*, International Journal of Economics and Financial Issues, **7**(2) (2017), 271.
- [3] ALSAEED K. (2005): *Activity-based costing in Saudi Arabia's Largest 100 firms in 2003*, Journal of American Academy of business, Cambridge.
- [4] ANDERSON, S.W. (1995): *A framework for assessing cost management system changes: The case of activity based costing implementation at General Motors 1986-1993*, Journal of Management Accounting, **7**(1) (1995), 1-51.
- [5] ARORA, A, AND RAJU, M. (2017): *The Effect of Firm's Size on the Adoption and Implementation of Activity Based Costing*, Splint International Journal of Professionals, **4**(7) (2017), 36-40.
- [6] BERNAMA BRIERLEY JA (2008): *An examination of factors influencing the level of consideration for ABC*, International Journal of Business and Management, **3**(8) (2008), 58-67.

- [7] BROWN, CHARLES C., AND MEDOFF JAMES L. (1988): *Employer Size, Pay, and the Ability to Pay in the Public Sector*, In *Whm Public Sector Workm Cr ionize*, edited by Richard B. Freeman and Casey Ichniowski. Chicago: Univ. Chicago Press (for NBER).
- [8] CLARKE, P.J. (1992): *Management Accounting Practices in Irish Manufacturing Businesses: A Pilot Stud*, The Irish Accounting and Finance Association Proceedings, **6**(1) (1992), 17-34.
- [9] COOPER, R. AND R. S. KAPLAN. (1988): *Measure cost right: make the right decisions*, Harvard Business Review, **66**(1) (1988), 96–103
- [10] COTTON; BROWN; AND JAKMAN. (2003): *Note on a New Zealand replication of Innes et al. UK activity-based costing survey*, Management Accounting Research, **14**(1) (2003), 67-72.
- [11] ELGAMMAL, W., SABA ZAKKA, J., EL-KASSAR, A., AND DANDASH, G.(2016): *Reasons behind the non-alication of the activity based costing system in developing countries, case of Lebanon*, The Journal of Developing Areas, **50**(3) (2016).
- [12] FADZIL FH AND RABABA A (2012): *Management accounting change: ABC adoption and implementation*, Journal of Accounting and Auditing: Research & Practice, **6**(2012), 1-17.
- [13] GOSSELIN, M. (1997): *The effect of strategy and organizational structure on the adoption and implementation of activity based costing*, Accounting, Organizations and Society, **22**(2) (1997), 105-122.
- [14] GUNASEKARAN, A, AND. SINGH, D. (1999): *Design of activity-based costing system in a small company: case study*, Computer & industrial Engineering, **37** (2)(1999), 413-416.
- [15] ZANDI INNES, T., AND MITCHELL, F. (2000): *Activity-based costing in the U.K.'s largest companies: a comparison of 1994 and 1999 survey results*, Management Accounting Research, **11**(1) (2000), 349-362.
- [16] ISMAIL TH AND MAHMOUD NM (2012): *The influence of organizational and environmental factors on cost systems design in Egypt*, British Journal of Economics, Finance and Management Sciences, **4**(2) (2012), 31-51.
- [17] KIANI, R AND SANGELADJI, M. (2003): *An Empirical study about the use of the ABC/ABM models by some of the Fortune 500 largest industrial corporations in the USA*, Journal of American Academy, Cambridge, **3** (2003).
- [18] KRUMWEIDE, K.R. (1998): *The implementation stages of ABC and the impact of contextual and organizational factors*, Journal of Management Accounting Research, **10**(1) (1998), 239-278.
- [19] MAELAH, R., AND IBRAHIM, N. D. (2006): *Activity Based Costing (ABC) Adoption Among Manufacturing Organizations - The Case of Malaysia*, International Journal of Business and Society, **7**(1) (2006), 70-101.
- [20] MAJID, J. AND SULAIMAN, M. (2008): *Implementation of activity based costing in Malaysia: A case study of two companies*, Asian Review of Accounting, **16**(1) (2008), 39-55.
- [21] NOOTEBOOM, B. (1994): *Innovation and Diffusion in Small Firms: Theory and Evidence*, Small Business Economics, **6**(5) (1994), 327-348.

- [22] PIERCE, B. AND BROWN, R. (2003): *An Empirical study of Activity-Based System in Ireland*, The Irish Accounting Review, **11**(1) (2003).
- [23] RAZ, T. AND ELNATHAN, D. (1999): *Activity-Based Costing for project*, International Journal of Project Management, **17**(1) (1999), 61-67.
- [24] RUNDORA, R., ZIEMERINK, T. AND OBERHOLZER, M. 2013: *Activity-based costing in small manufacturing firms: South African study*, The Journal of Allied Business Research, **29**(2) (2013), 485–498.
- [25] SHIELDS, M.D., AND MCEWEN, M.A. (1996): *Implementing ABC systems successfully*, Journal of Cost Management, **6** (1996), 15-22.
- [26] TSAI, WH. AND JHONG, SY. (2019): *Production decision model with carbon tax for the knitted footwear industry under activity-based costing*, Journal of Cleaner Production, **207** (2019), 1150-1162.
- [27] YAPA P AND KONGCHAN P (2012): *Factors influencing the implementation of activity-based costing in Thailand: A case study of a Thai telecommunications company*, Accounting and Finance Association of Australia and New Zealand, **3**(1) (2012), 1-24.

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