



## **The Implementing Activity-based Costing Technique and Its Impact on Profitability: A Study of Listed Manufacturing Companies in Jordan**

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### **ABSTRACT**

The main objective of this study is to investigate and evaluate the effect of implementing the activity-based costing technique (ABC) to the profitability of the manufacturing companies in Jordan. The sample of this study includes 72 observations; these observations are six financial ratios based on the financial statements of 12 industrial companies in Jordan that implemented the ABC technique in the period 2000-2011. A 4-year average pre and post the implementation of the ABC technique is taken for all technique variables. The profitability ratios are the return on assets (ROA), return on investment ratio (ROI), return on equity (ROE), gross profit margin (GP), operating margin ratio (OM), and net profit margin ratios (ROS). Using a paired t-test in order to test the significance difference between the pre and post implementation of the ABC technique, the results indicate that four financial ratios, namely the OM, ROS, ROA, and ROE ratios increased and improved after the implementation of the ABC technique. The OM and ROA ratios recorded as the highest ratios for 58.33% of the companies in the sample, while the ROS and ROE ratios increased by 50% for the companies in the sample. Furthermore, the GP ratio indicates that most ratios decreased after the implementation of the ABC technique. The ratio deteriorated for 9 companies out of 12 in the GP ratio, which means that 75% of the companies experienced a decrease in the GP ratio after the implementation of the ABC technique. In addition the ROI ratio decreased for 7 companies out of 12. The results also show little evidence suggesting that using the ABC technique improves the company's profitability ratios with a percentage of 47.22% and there is a general decrease in the profitability ratios for companies that implement the ABC technique with a percentage of 52.78%. It can be concluded that there is no significant overall improvement in the profitability ratios of Jordanian manufacturing companies after the implementation of the ABC technique.

**Keywords:** Activity-based Costing Technique, Profitability, Jordan

**JEL Classifications:** L6, M410

### **1. INTRODUCTION**

In the past century, two common costing techniques were used in companies, namely the activity-based costing (ABC) (the new costing technique) and the traditional costing technique. The traditional costing technique assigns indirect manufacturing (manufacturing overheads [MOH]) based on the volume of a cost driver (causes the cost to incur), such as direct material hours, the number of machine hours or the amount of direct labor hours needed in order to produce an item or to provide a service. Conversely, the ABC technique assigns the indirect manufacturing of a product or service according to the activities needed to produce the item. From this perspective, the managers should have a good

knowledge and understanding of the advantages and disadvantages of both techniques in order to better meet the decision-making requirements of the managers.

The common disadvantage of traditional costing is that it recorded unsuccessfully in assigning non-MOH costs that also are connected with the production of an item, such as administrative expenses. Whereas the advantages of using traditional-based costing involve:

1. Accordance with the generally accepted accounting principles (Tanju and Helmi, 1991).
2. Easy implementation, particularly for companies that produce one product or provide one service. In addition, because of the enormous development of technology, a large number

of companies around the world have implemented modern machines and computers for much of their production cycle. With reference to this change in the business environment, traditional costing represents an outdated costing technique.

In response to the new conditions, the business adopted a new approach to addressing the recent developments in the business environment such as: The developments of technology over the past half century and the interaction of global economies, which leads to globalization and reduced new definitions and accounting techniques on management in general, such as balanced scorecards, ABC and activity-based management. These techniques have been widely endorsed by practitioners and researchers in terms of the accuracy in the recalculation of MOH costs.

It may be concluded that the ABC works best in complex environments compared with a streamlined environment (Cooper and Kaplan, 1991), where there are many products, machines, and technological components. The ABC is also effective in relation to complex processes that are not easy to resolve. In order to switch to the ABC technique, the company must complete many preliminary steps such as implementing changes to management, providing executive management support, continuing education and training programs, and promoting communication skills. The common disadvantages of the ABC technique are the complexity, costs (before and after the implementation), and lengthy implementation thereof.

The main objective of this study is to evaluate the impact of the ABC adopters in relation to the profitability of manufacturing companies in Jordan, and to use a paired t-test in order to test the significance difference between the pre and post implementation of the ABC technique.

## 2. LITERATURE REVIEW

### 2.1. The Association between the ABC Technique and Financial Performance

One of the main papers within the current body of literature on ABC was drafted by Cooper and Kaplan in 1987. The study conducted by Cagwin and Bouwman (2002) sought to evaluate the effect of applying the ABC technique in relation to financial performance, with the results of the study indicating that there is a positive association between the application of the ABC technique and the improvement of the ROI ratio when implemented in complex companies, and that costs are comparatively important. Furthermore, the study of Ittner et al. (2002) examined the association between ABC and ABM performance. They found that there is no significant association between the ABC and the return on assets (ROA), and also found a weak correlation between the ABC and accounting profitability. Conversely, Banker et al. (2008) found a positive impact of the ABC on plant performance in world-class manufacturing practices.

In addition, the study of Zaman (2009) found that the efficiency and effectiveness increased and had a significant effect on

corporate performance. The study of Jänkälä and Silvola (2012) investigated the effect of the use of the ABC on the performance of small firms. A survey was used, with the results indicating that declining companies seek to use the ABC technique in order to improve their growth and profitability in the near future. The study of Knápková et al. (2014) analyzed the use of the ABC concept in Czech firms and the effect on the financial performance of companies; a questionnaire survey was used for this purpose. They find weak evidence for the association between the implementation of ABC technique and the impact of the company's age, specialization and size. Using a t-test, the improvement of the selected financial performance of the firms, and the two indexes namely the ROA and the return on equity (ROE) were tested, with the results indicating that no effect was identified on the financial performance of the firms that implemented the ABC system. The study of Kennedy and Affleck-Graves (2001) indicated that the implementation of the ABC in companies in the UK may have a significant impact on firm value in terms of better cost controls and asset utilization, and better use of financial leverage. Both accounting and market-based performance measures show an increase following the implementation of the ABC. The study of Pokorná (2016) investigated the link between the implementation of the ABC among Czech corporations and the improvement in financial performance. In order to collect the relevant information, an empirical survey was designed and distributed in 548 Czech medium and large size companies from different economic sectors. The ROA was used in order to measure the financial performance for the period 2005-2011. The results show that the companies that implement the ABC have the same or an even lower average financial performance than the companies which do not adopt the ABC techniques.

### 2.2. The Implementation of the ABC Technique in the Jordanian Manufacturing Companies

The implementation levels of the ABC accounted for approximately 10% in 2001 (Khasharmeh, 2002), and up until 2009 the implementation levels of the ABC increased to 56% (Nassar et al., 2013). The lack of accuracy in selecting the cost drivers is the main challenge to the implementation of the ABC technique in Jordan (Al-Ghazzawi's, 2003). The study of Al-Khadash and Nassar (2010) analyzed the improvement in financial performance associated with the use of ABC. The results indicated that the perception level of using the ABC is high among financial managers, and it was found that the implementation of the ABC technique was low in the Jordanian industrial sector. Furthermore, the association between the ABC and the improvement of the ROA is positive.

To summarize, there is a lack of evidence from the previous literature regarding the effects of the ABC on corporate performance. Furthermore, the most common data collection method used in the previous literature is represented by questionnaires.

## 3. HYPOTHESIS

In order to fulfill the main objective of the study, the following hypotheses have been formulated.

$H_0$ : There is no significant improvement in the profitability of Jordanian manufacturing companies overall after the implementation of the ABC technique.

$H_1$ : There is a significant improvement in the profitability of Jordanian manufacturing companies overall after the implementation of the ABC technique.

## 4. METHODOLOGY

### 4.1. Variables of the Study

This study is classified as a comparative study. The dependent variable is the implementation of the ABC technique, while the profitability indicators are the independent variables shown in Table 1.

#### 1. ROA

This ratio was used by Balakrishnan et al. (1996) and Al-Khadash and Nassar (2010). They stipulate that the implementation of the ABC technique influences the ROA at a corporate level and that the improvement in the ROA is positive.

#### 2. Return on investment (ROI)

This ratio was used by Cagwin and Bouwman (2002). The study showed a positive association between the implementation of the ABC technique and the improvement in the ROI.

#### 3. ROE.

#### 4. Gross profit margin (GP).

#### 5. Operating margin ratio (OM).

#### 6. Net profit margin ratio (ROS).

### 4.2. Population of the Study

The sample of this study includes 72 observations shown in Tables 2 and 3, which represent financial ratios based on the financial statements of 12 industrial companies in Jordan which

implemented the ABC technique in the period 2000-2011. A 4-year average pre and post the implementation of the ABC technique is taken for all variables. The period was selected on the basis of the year during which the ABC technique was first implemented in Jordan and year 2011 so that a comparison of the 4 years after the implementation of the ABC technique may be drawn. The appropriate statistical tool model to test the significance of a difference between the pre and post implementation period of the ABC technique based on financial ratios is in this case a paired sample t-test statistic.

The summary statistics of independent variables used in this study shown in Table 4.

## 5. EMPIRICAL RESULTS

### 5.1. Analysis of Financial Ratios

In order to analyze and compare the profitability before and after applying the ABC technique, six different financial ratios are calculated and discussed in Table 3.

As noted from Table 3, the financial ratios were positively affected after the implementation of the ABC technique in 9 companies, which means that a percentage of 75% of the companies in the sample were affected. The remaining 3 companies were adversely affected. This is illustrated in more detail in the results shown in the Table 3, whereby the most affected ratios are the OM, ROA and ROE. An increase in the OM and ROA ratios was observed for seven companies, including one company which demonstrated a statistically significant increase. Furthermore, the ROE ratio only increased in six companies. This result of an increasing ROA ratio is associated with the results obtained by Al-Khadash and Nassar (2010) indicating that there is a positive relationship between the implementation of the ABC technique and the improvement in the ROA ratio.

**Table 1: Profitability indicators**

Independent variables	Formula
Gross profit margin (GP)	$=(\text{Net sales}-\text{Cost of goods sold})/\text{Net sales}$
Operating margin (OM)	$=\text{Income before interest and Tax}/\text{Net sales}$
Net profit margin (NP)	$=\text{Net income}/\text{Net sales}$
Return on assets (ROA)	$=\text{Net profit after Tax}/\text{Total assets}$
Return on equity (ROE)	$=\text{Net profit after Tax}/\text{Total equity}$
Return on investment ratio (ROI)	$=(\text{Gain from investment}-\text{Cost of the Investment})/\text{Cost of the investment}$

**Table 2: The sample description**

Company name	Reuter code	Traded securities	Operation year
General Mining	GENM	1,500,000	1975
The Industrial Commercial and Agricultural	ICAG	14,956,389	1964
Dar Al Dawa Development and Investment	DADI	25,000,000	1976
Arab Center for Pharmaceuticals and Chemicals Industries	APHC	5,000,000	1983
National Cable and Wire Manufacturing	WIRE	19,299,747	1983
Elzay Ready Wear Manufacturing	ELZA	6,705,246	1992
Jordan Steel	JOST	35,000,000	1993
Arab Electrical Industries	AEIN	6,000,000	1993
Union Tobacco and Cigarette Industries	UTOB	15,083,657	1993
Comprehensive Multiple Projects	INOH	5,250,000	1994
Nutridar	NDAR	11,615,912	1995
Middle East Complex for Engineering, Electronics and Heavy Industries	MECE	25,000,000	1994

**Table 3: Comparison of the profitability indicators before and after the implementation of the ABC technique**

Company code (reuter code)	Before/after	GP (%)	OM (%)	ROS (%)	ROA (%)	ROE (%)	ROI (%)
GENM	Before	64.40	27.80	24.10	10.20	11.80	11.60
	After	65.70	30.90	22.90	9.30	10.80	10.80
ICAG	Before	18.10	-0.20	-9.60	-6.20	-22.00	-15.60
	After	-16.20	-11.90	-19.20	-5.80	-17.60	-17.50
DADI	Before	53.20	25.50	24.00	13.60	15.80	15.80
	After	48.80	18.80	16.90	9.20	10.90	10.80
APHC	Before	38.10	17.50	15.80	8.30	9.20	9.20
	After	15.00	7.20	6.60	1.10	1.20	1.20
WIRE	Before	8.80	-0.70	-0.80	-0.10	0.20	0.10
	After	8.60	2.90	2.20	2.40	3.30	3.10
ELZA	Before	20.20	6.80	-3.30	-2.10	-4.90	-4.10
	After	14.20	-1.10	-5.70	-1.00	-7.80	-7.80
JOST	Before	17.60	16.50	13.60	12.70	17.20	17.20
	After	3.60	4.10	2.40	4.00	2.40%	4.00
AEIN	Before	15.30	3.40	-1.50	0.90	1.20	1.30
	After	14.10	8.50	5.80	5.50	5.40	5.10
UTOB	Before	14.80	11.30	9.80	16.50	27.00	25.90
	After	14.50	12.30	10.40	8.60	12.10	12.10
INOH	Before	12.10	-19.30	-22.70	-11.10	-11.80	-10.70
	After	12.60	7.80	3.90	5.30	5.00	5.10
NDAR	Before	28.30	-8.60	-17.90	-3.80	-753.20	-5.80
	After	30.50	4.80	2.60	3.30	3.30	3.30
MECE	Before	18.10	12.00	4.80	2.50	5.70	5.30
	After	17.60	19.40	12.30	6.40	12.20	11.10

GP: Gross profit margin, OM: Operating margin, ROS: Net profit margin ratio, ROA: Return on assets, ROE: Return on equity, ROI: Return on investment ratio, ABC: Activity-based costing

**Table 4: Summary statistics of variables**

Stastical description	GP	OM	ROS	ROA	ROE	ROI
Mean	0.224	0.082	0.041	0.037	-0.276	0.038
Standard deviation	0.185	0.109	0.117	0.059	1.099	0.097
Minimum	0.009	-0.061	-0.144	-0.060	-3.750	-0.166
Maximum	0.651	0.294	0.235	0.126	0.196	0.190

GP: Gross profit margin, OM: Operating margin, ROS: Net profit margin ratio, ROA: Return on assets, ROE: Return on equity, ROI: Return on investment ratio

Table 3 shows that 9 companies out of 12 experienced a decrease in the GP ratio, which means that 75% of the companies experienced a decrease in the GP ratio following the implementation of the ABC technique. Furthermore, only 3 companies show an increase in the GP ratio, but not significantly. The 3 companies that have an increase in GP ratio are GENM, INOH, and NDAR. These 3 companies showcasing an improvement in the GP ratio can control their overheads costs in an efficient manner, while the other 9 companies that have a deteriorated GP ratio could not maintain their MOH costs under control. And this is perhaps related to a limited knowledge or experience in how to implement the ABC technique in an effective manner.

Table 3 also shows that in the case of the three profit margin ratios namely the GP ratio, OM ratio, and ROS ratio, the GP ratio increased insignificantly for 3 companies, while the other 9 companies in the sample deteriorated. Nevertheless, 3 out of 9 companies deteriorated significantly. This ratio varies from company to company and industry to industry, which indicates that the management used labor and supplies in an inefficient manner in the production process. The increase in material and labor costs that may lower the GP ratio constitutes another reason. The other

ratio in the profit margin is the OM ratio, which increased for 7 s out of 12 companies as shown in Table 1. These 7 companies include 1 company which experienced a significant increase, indicating that the 7 companies are controlling their costs more effectively as opposed to the period preceding the implementation of the ABC technique. On the other hand, the ROS ratio is the third ratio included in the profit margin ratio group. The ratio increased for 6 companies out of 12 and this represents 50% of the sample. From this result we can conclude that only the OM ratio was affected after the implementation of the ABC technique rather than the GP and the OM ratios. Furthermore, the GP ratio only accounts for the costs of direct materials and direct labor, while the OM ratio includes the calculation of direct materials and direct labor plus the administration and selling costs. In addition to the GP and OM ratios, the ROS ratio provides a comprehensive knowledge about the profit after deducting both variable and fixed costs.

Based on the previous results, it may be inferred that the four financial ratios, namely the OM, ROS, ROA, and ROE ratios increased and improved. Specifically, the OM and ROA ratios were recorded as the highest increasing ratios for 58.33% of the companies in the sample, while the ROS and ROE ratios increased by 50% for the companies in the sample. In addition, the INOH and NDAR companies demonstrated an increase in all ratios, with NDAR demonstrating a statistically significant increase in the OM, ROS, ROA, and ROI ratios as illustrated in Table 4. NDAR started its operation in 1995 with (11.6 million Jordan dinar), and the company participated in many conferences and exhibitions around the world as a marketing strategist. Furthermore, the company has more than one kind of products and operates in a complex environment, meaning that the company is operating in accordance with the primary conditions with reference to the appropriate implementation of the ABC technique.

### 5.2. Paired Sample t-statistics

A paired t-test is used by the SPSS in order to test the significant difference in the financial ratios for the two periods of time (before and after implementing the ABC technique). Table 5 presents the analysis of the six financial ratios tested. After using the paired t-test, the standard cutoff is ( $\alpha = 0.05$ ), the decision made in relation to the P value. The null hypothesis will be rejected when  $P < 0.05$  and approved when  $P > 0.05$ . Table 5 shows that the 72 observations showed no significant effect in most ratios after

the implementation of the ABC technique with the exception of two companies. NDAR shows 4 significant improvements in the OM, ROS, ROA, and ROI ratios. And JOST shows 4 deteriorated significant ratios, namely the GP, OM, and ROS. From these results, it is possible to accept the null hypotheses which states that there is no significant improvement in the profitability of Jordanian manufacturing companies overall after the implementation of the ABC technique. However, the same companies show an improvement in profitability after the implementation of the ABC technique.

**Table 5: Paired sample t-statistics of the companies which applied the ABC technique**

Company code (reuter code)	GP	OM	ROS	ROA	ROE	ROI
GENM	0.761	0.802	0.894	0.822	0.880	0.883
ICAG	0.033*	0.395	0.486	0.957	0.808	0.884
DADI	0.086	0.199	0.198	0.112	0.159	0.153
APHC	0.000*	0.627	0.665	0.183	0.168	0.161
WIRE	0.746	0.593	0.638	0.642	0.737	0.769
ELZA	0.419	0.682	0.946	0.753	0.944	0.877
JOST	0.020*	0.020*	0.033*	0.116	0.111	0.080
AEIN	0.669	0.518	0.443	0.224	0.497	0.569
UTOB	0.727	0.431	0.507	0.083	0.041*	0.043*
INOH	0.752	0.316	0.329	0.255	0.459	0.467
NDAR	0.768	0.000*	0.037*	0.000*	0.104	0.000*
MECE	0.532	0.143	0.168	0.091	0.488	0.454

GP: Gross profit margin, OM: Operating margin, ROS: Net profit margin ratio, ROA: Return on assets, ROE: Return on equity, ROI: Return on investment ratio, ABC: Activity-based costing. \*significant at 0.05 level

The previous tables can be summarized in Table 6 and Figure 1 in order to draw a brief comparison and to present the results after the financial analysis and the paired t-test.

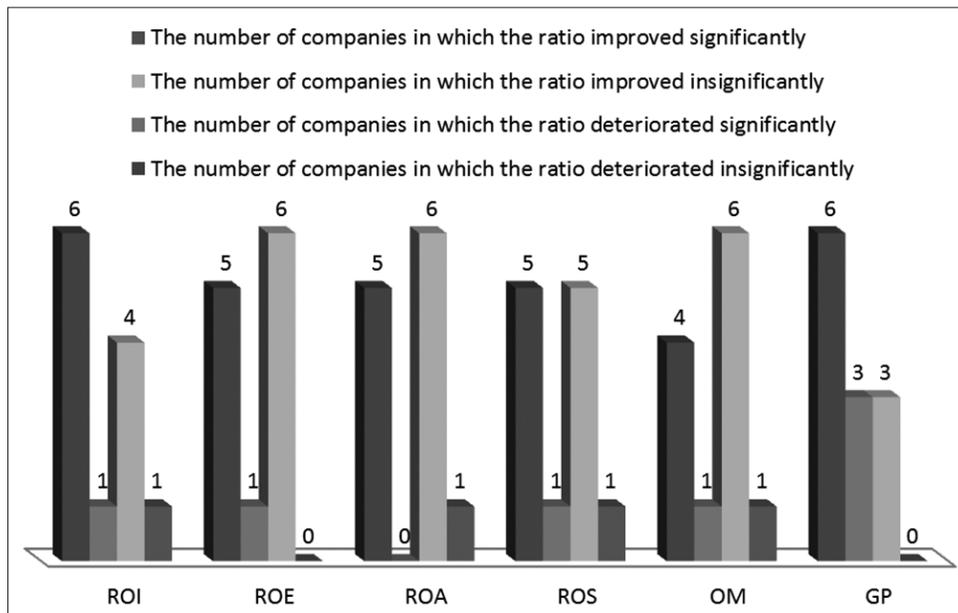
Finally, the ABC technique should not be the only technique or strategy tool for a company in order to achieve high profitability or a competitive advantage. And in order to improve company profitability the management should use other techniques or strategies apart from the ABC technique, such as increasing sales revenue, creating a customized website for the company, prioritizing the use of social media channels such as Facebook or, Twitter. This also constitutes an effective way to increase the number of new customers as they are low-cost marketing techniques, which makes it possible to increase the sales revenue in the short and long run. Decreasing costs is another strategy which can be used with the ABC technique, such as decreasing direct costs by providing discounts on large purchases. Additionally,

**Table 6: The summary of profitability indicators compared with the number of companies**

Description	GP	OM	ROS	ROA	ROE	ROI
The number of companies in which the ratio improved significantly	0	1	1	1	0	1
The number of companies in which the ratio improved insignificantly	3	6	5	6	6	4
The number of companies in which the ratio deteriorated significantly	3	1	1	0	1	1
The number of companies in which the ratio deteriorated insignificantly	6	4	5	5	5	6

GP: Gross profit margin, OM: Operating margin, ROS: Net profit margin ratio, ROA: Return on assets, ROE: Return on equity, ROI: Return on investment ratio

**Figure 1:** Corporate analysis of the ratios after the implementation of the activity-based costing technique



companies should find an alternative and cheaper energy resource, such as for example solar energy. In Jordan the electricity bills are very high, which in turn reduce the net profit of companies indirectly over time.

## 6. CONCLUSION

This study is a comparative study seeking to investigate the implementation of the ABC technique to the profitability ratios in the Jordanian industrial corporations during the period 2000-2011. The financial ratios have been collected from financial statements, with an average of 4 years before and after the implementation of the ABC technique. The profitability ratios are the ROA, ROI, ROE, GP, the OM, and the ROS. The statistical tool used in order to test the significant difference for financial ratios for the two periods is the paired t-test. The results show that four financial ratios, namely the OM, ROS, ROA, and ROE ratios increased insignificantly following the implementation of the ABC technique. The OM and the ROA ratios were recorded as the highest increasing ratios for 58.33% of the companies in the sample, while the ROS and ROE ratios increased by 50% for the companies in the sample. Furthermore, the GP and ROI ratios for most companies decreased after the implementation of the ABC technique. The GP ratio deteriorated for 9 out of 12 companies, which means that 75% of the companies experience a decrease after the implementation of the ABC technique.

It can be concluded that there is no significant improvement in the profitability of Jordanian manufacturing companies overall after implementing the ABC technique. In general, these results are associated with the findings of Pokorná (2016) which indicated that the companies implementing the ABC have the same or an even lower financial performance on average than the companies which do not apply the ABC techniques. The study suggested that the Ministry of Industry and Trade in Jordan should provide more conferences about modern managerial accounting techniques, such as the ABC technique in order to increase the number of companies that implement the ABC technique.

Future studies in this field could use more ratios and draw a comparison with the companies which do not adopt the ABC technique. Researchers can also evaluate the effect of the ABC using other statistical tools such as the data envelopment analysis technique.

There are certain limitations to this study. The main limitation of this study is represented by the poor references in the literature related to the use of financial ratios for comparison purposes. Moreover, only a limited number of companies have implemented the ABC technique in the industrial sector in Jordan, which means

that the sample is small in size. Nevertheless, the limitations associated with the accounting policies and the methods adopted by industrial corporations are not investigated.

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