

CHAPTER THREE
EMPRICAL STUDIES

SECTION ONE

METHODOLOGY

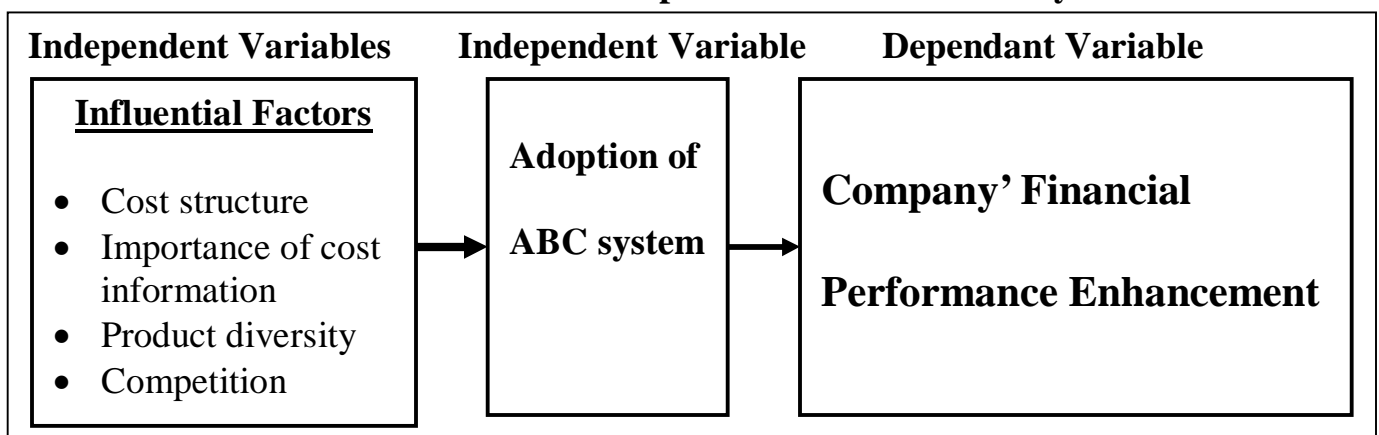
3.1.1 Introduction

The purpose of this chapter is to present the conceptual framework for this study and hypotheses development. In addition, it identifies the independent, dependent, and control variables for the study, the population and sample size, the study’s methods, the procedures for collecting and analyzing data, results discussion, findings and recommendations.

3.1.2 The conceptual framework

The conceptual framework for this study explores the relationship between the adoption of ABC system and financial performance enhancement through investigating some factors which influence the adoption of ABC system as in the Exhibit 3/1/9. The primary dependant variable is financial performance enhancement. The independent variables include: influential factors (cost structure or potential for cost distortion, importance of cost information, product diversity, and competition); and ABC system adoption. Control variable is company size.

Exhibit 3/1/9: Conceptual framework of Study



Source: Researcher, 2013

3.1.3 Study Variables Measurement:

The variables for this study were three: independent variables which include factors affect adoption of ABC system; adoption of ABC system. Dependent variable is financial performance improvement. Control variable is company size.

3.1.3.1 Independent Variables

The study included two independent variables are: influential factors which include (cost structure, importance of cost information, product diversity, and competition); and adoption of ABC system.

Objective data were used to measure the variable cost structure, while other variables measured by using interview data.

a. Factors affect ABC adoption

- i. Cost structure (potential for cost distortion):** Objective data are used to measure this variable. Some previous studies (e.g., Schoute; Cinquini, et al.; Nancy; Lado) used a percentage of manufacturing overheads in total costs as a measure. Therefore, respondents asked to provide an approximate a percentage breakdown of their cost structure by entering the percentage of each cost item (question 4).
- ii. Importance of cost information:** This variable consisted of four items (question 12) that signifies the degree of decision usefulness of cost information. It is affected by the competitive environment of the business, and the company's need for cost data in its cost reduction; cost control and making decisions (e.g., pricing, make or buy; producing new products; adding or dropping products, product lines or departments; introducing new market; product profitability analysis). These measures based on some previous studies (Cinquini, L.,et al.; Nancy).

iii. Product diversity: this variable was measured by using two set of questions to measure volume diversity and support diversity. Concerning volume diversity, respondents asked to indicate number of products (question 3), and whether product lines are quite different, and whether major differences exist in product volumes or lot sizes (question 13 “a & b”). Support diversity was measured by asking respondents to indicate whether their products require similar resources to produce, redesign and distribute; and whether the costs of support departments (e.g., engineering, purchasing, and marketing) are the same for each product line (question 13 “c & d”). These measures based on some previous studies (Bjornenak; Nancy).

iv. Competition: Competition was measured by asking respondents (question 14) to indicate the intensity of competition with regard to three elements: price, product and market competition. These measures based on some previous studies (e.g., Schoute; Nancy)

b. Adoption of ABC system

The ABC adoption variable is defined based on the response to the interview questions. The respondents were asked to indicate whether their companies adopt or not adopt ABC system. ABC system adopters comprise companies are currently adopting and implementing ABC; companies has begun or plan to adopt ABC system in the near future (question 9 “c , d & e”). Non-ABC adopters comprise companies that have not yet adopted ABC system, or have rejected ABC system after they adopted or assessment (question 8 “a & b”). Some previous studies used these measures to evaluate this variable (e.g., Nancy; Lado; Kenndy & Affleck-Graves).

3.1.3.2 Dependant Variable (Financial performance)

Financial performance variable is defined in two measures (cost, net profit). The selection of these measures was based on that there was no actual data on ABC system implementation by Sudanese manufacturing companies. Sudanese manufacturing companies just adopted traditional costing systems. Therefore, the measurement in this study was based on the analysis of company costing data to calculate product cost and net profit under ABC system. The differences in calculated total costs or overhead costs between company's costing system and ABC system lead to the same difference in net profit. Comparative analysis was used to compare unit costs and net profit between ABC system and companies existing costing systems.

The previous studies which used these measures (cost, net profit) to evaluate performance are: El shesheni, H.M.A., used (net profit), Ittner, C. D., et al. used (cost) for manufacturing performance. Nancy, M.M.A., used (cost) for manufacturing performance.

3.1.3.3 Control Variable

a. Company Size: There is considerable evidence from the literature that the adoption rates of ABC system are much higher in large companies than small companies. The large companies are argued to have more complex and diverse facilities and greater resources available, and to employ more professional and skilled workers, that facilitate the adoption of innovations. The results of prior studies in the area of ABC are somewhat mixed, however, for example, Bjornenak; Gosselin; and Nancy, have found no association between the size of companies and the adoption of ABC. While, Krumwiede; Baird et al.; Al-Omiri & Drury; Abusalama, found that large companies were more likely to adopt ABC system than small companies.

The common measures of company size are: employment (number of employees) and company asset (capital) and annual sales figures. Another measure of size is the number of different products produced by each company. This study used number of employees as measure of company size due to the difficulties in collecting accurate data about the other possible measures. The selection of this measure is based on some previous studies such as (Schoute; Lado; Nancy; El shesheni) just to name a few. Ministry of industry in the Sudan classifies companies according to size (number of employees) to four categories: (a) Small companies (10-24). (b) Medium companies (25-49). (c) Large companies (50 – 99). (d) Very large companies (more than 100). Respondents ask to indicate the number of employees by their companies (question 1). The table 3/1/4 shows variables measurement used in this study.

Table 3/1/4: Details of the independent, dependent and control variables

Types of Variables	Variables	Proxy Measures	Question No.
Independent Variables	Cost structure	Percentage of overhead cost in total costs.	8
	Importance of cost information	uses of cost information	16
	Product diversity	<ul style="list-style-type: none"> • Volume diversity • Support diversity 	7 & 17 17
	Competition	Intense of competition	18
	Adoption of ABC	ABC/ Non –ABC	14
Dependant Variables	Financial performance	Cost reduction Net profit improvement	Objective data
Control Variables	Size	Number of employees	5

Source: Researcher, 2013

3.1.4 The Population and Sample Size

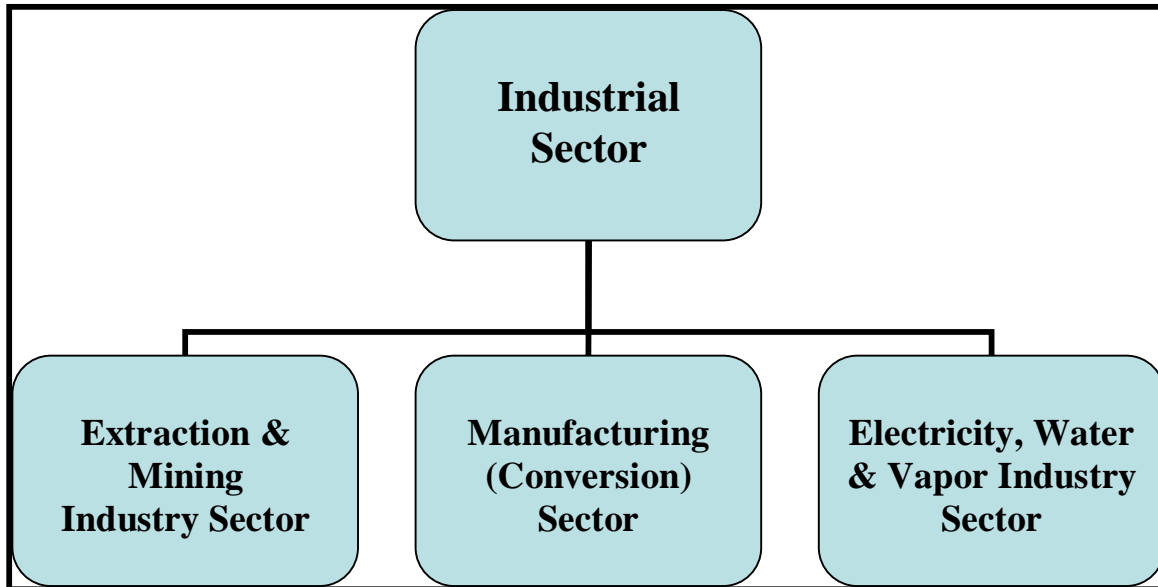
3.1.4.1 The population of Study

The population of this study defined as industrial sector. Industrial sector is viewed as one of the main economic sectors in the Sudan. It is mainly built upon three industries as in Exhibit 3/1/10: (a) extraction and mining industry. (b) Electricity, water and vapor industry. (c) Manufacturing (conversion) industry. Industry started in the Sudan in 1918 with cement factory. Food processing industry started in the 1940s with vegetable oil extraction and laundry soap production. In addition, there were many traditional handcraft industries. The gaining of cotton encouraged the beginning of industry in the Sudan in the early 20th century. The concept of the ‘industrial development’ emerged in Sudan soon after independence. With expansion of cotton production, the number of gaining factories has increased, with the Gezira Board alone operating the World’s largest single ginning complex. Further expansion in the industrial sector was achieved with established of sugar industry in 1960s. During the 1960s and the following decades, economic development was characterized by central planning and dominance of the public sector. The government invested in heavy industries and largest infrastructure projects such as roads, airports, ports, housing, water, power supply and telecommunications¹.

The overall contribution of industrial sector to Sudan GDP appear in its big correlation with other economic sectors (agricultural and service); substantial contribution in total local production; availability of consumer goods; plenty of targeted goods for export; creation new jobs and means of diversification of personnel and national income

¹ . Lado, J.W.J, Op.Cit, p.122.

Exhibit 3/1/10: Industrial Sector



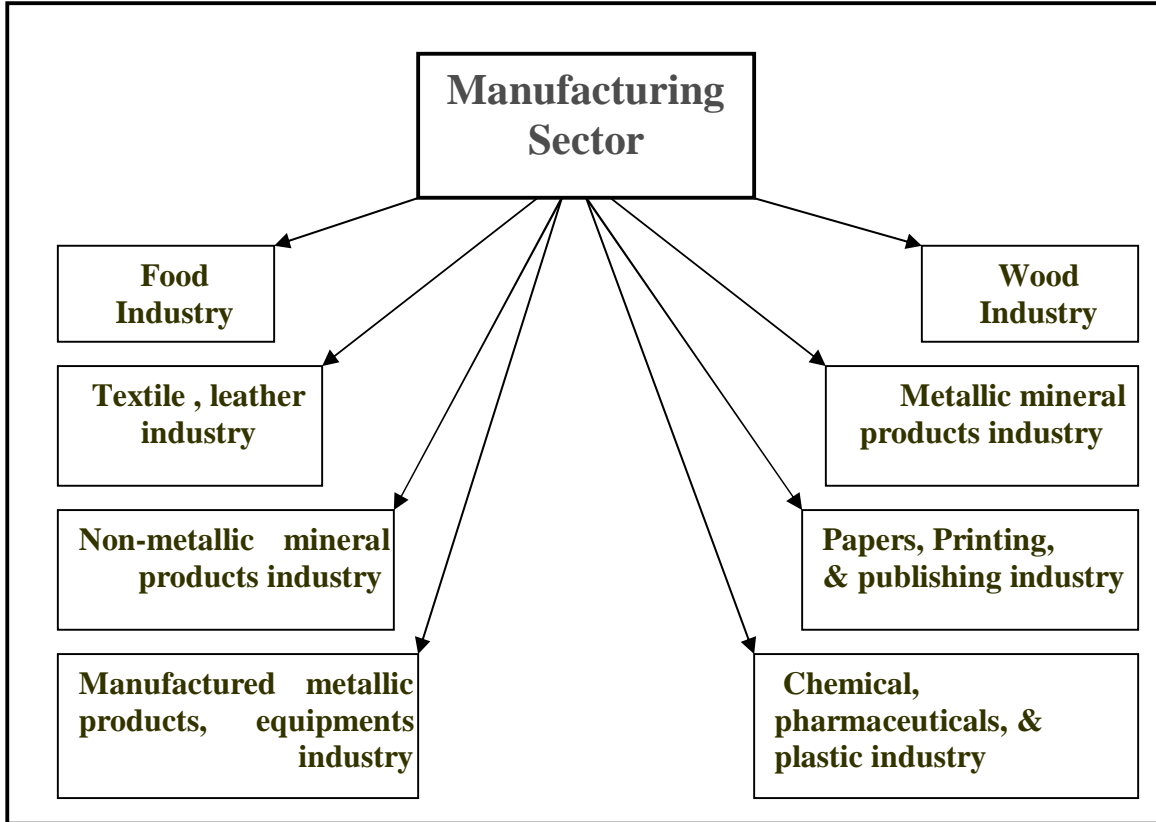
Source: Researcher, 2013

This study focuses on the industrial sector for two reasons: (a) there is a clear trend in the social and economic development plans of successive Sudanese Governments to support the industrial sector. Recently, this has been one of the central preoccupations of the government and industry alike. (b) Industrial companies are exposed to changes in the industrial environment such as changes in the production cost structure and new high-technological manufacturing techniques. Owing to these changes, industrial companies are also commonly associated with implementing cost accounting innovations such ABC system.

The target industrial sector for this study was manufacturing (conversion) sector which comprise eight manufacturing sub-sectors according to the international statistics in United Nation as in exhibit 11 are: Food substances & drinks industry, Yarn, textile and leather industry, Wood industry, Papers, printing and publishing industry, Chemical, pharmaceuticals, rubber, and plastic products industry, Non-metallic mineral

products industry, Metallic mineral products industry, Manufactured Metallic products and equipments industry).

Exhibit 3/1/11: The population of Study



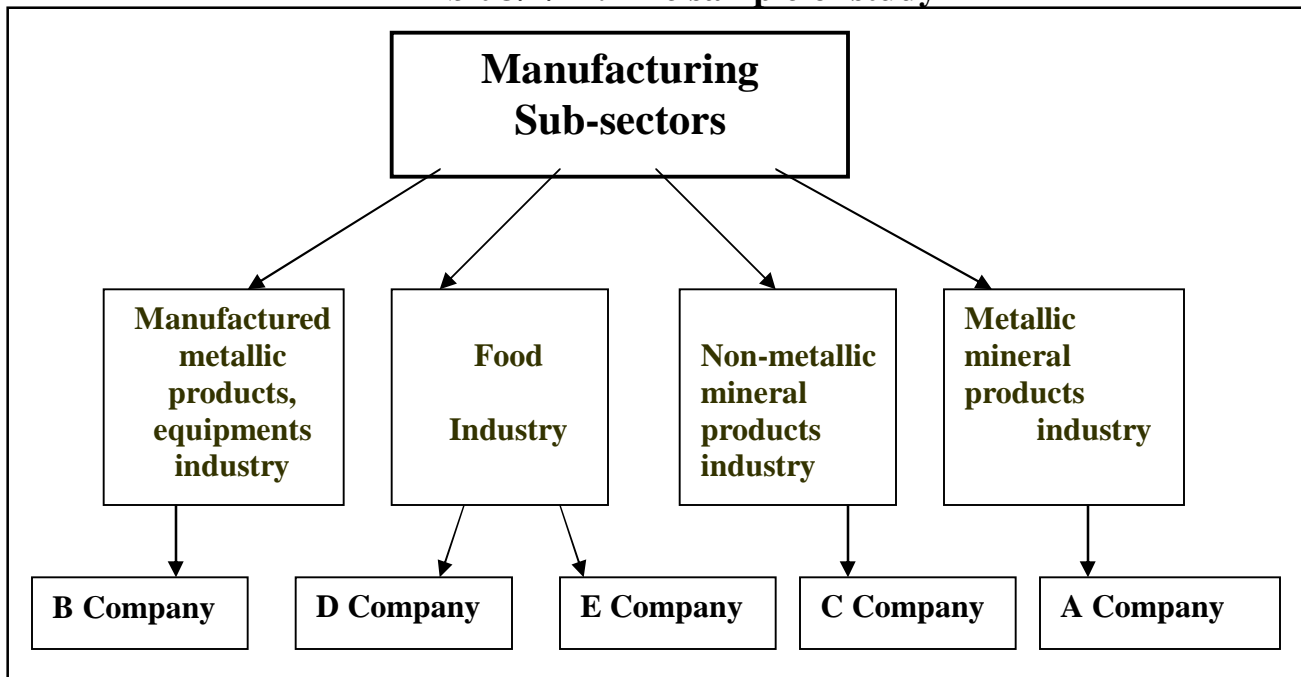
Source: Researcher, 2013

3.1.4.2 The sample of study

The sample of study is purposive sample which consists of four manufacturing sub-sectors which represent about (50%) of manufacturing (conversion) industry sub-sectors (four of eight sub-sectors) as in exhibit 12 are: (a) metallic mineral products industry. (b) manufactured metallic products and equipments industry. (c) non-metallic mineral products industry. (d) food substances & drinks industry. The representative sample consists of five manufacturing companies represent the four sub-sectors.

These manufacturing companies were selected as the area for this study for two reasons: (a) the manufacturing sector is one of the largest sector on industrial sectors which characterized with high levels of overhead costs and high use of technology and producing a variety of products. Therefore, there is a critical need for more refined costing system such as ABC system for providing more accurate cost information for strategic decisions rather than traditional or existing costing systems. (b) The sample (five companies) was selected based on availability and accessibility for cost data; and that companies have a costing system to provide a great data to adopt ABC system. In addition, other companies have an obligation to make financial data public.

Exhibit 3/1/12: The sample of study



Source: Researcher, 2013

3.1.5 Data collection

Two types of data were collected for this study, quantitative data and qualitative data. Quantitative data were collected from archive accounting data (cost sheets) for the year 2012 related to dependant variable. The analysis of accounting archive data was done to apply ABC system based on (Cooper's two –stages activity based costing model) in two stages which comprise four steps to adopt ABC system to calculated product cost and net profit. Comparative analysis of the results regarding product cost and net profit was done between ABC system and traditional costing systems. Qualitative data were collected by using semi-structured interviews for most appropriate representatives members that have enough knowledge about ABC system such as financial managers, and cost accountants) for the study's sample (five SMCs). The interview data include questions related to general information about the company's costing system, current status of adoption of ABC system; reasons for ABC adoption; factors influence the adoption of ABC system; problems and difficulties associated with adoption of ABC system and reasons for non-adoption. The study used a content analysis to analyze qualitative data. Qualitative data analysis software packages, such as NVivo, were not used. This was primarily because the data analysis computer software did not support Arabic characters.

SECTION TWO

DATA ANALYSIS & FINDINGS DISCUSSION

3.2.1 Data Analysis

The quantitative data (archive accounting data) were analyzed based on (Cooper Two Stage Activity based Costing Model). The study used a content analysis to analyze qualitative data. Qualitative data analysis software packages, such as NVivo, were not used. This was primarily because the data analysis computer software did not support Arabic characters.

3.2.1.1 Quantitative data (archive data) Analysis : Application of Activity based costing (ABC)

The application of ABC systems in manufacturing companies has been done according to (Cooper Two Stage Activity based Costing Model) which was mentioned above by using accounting records to apply ABC system and calculated cost per unit for the year 2012 for Companies (B,C,D,E) and (just one month) for A company (due to unavailability of accurate data for whole year) . In addition, the study conducted personnel interviews with financial manager, head of cost accounting department, production managers, and engineers to identify suitable activities cost pools and related cost drivers.

a. Company A

Company A is an industrial company established in 1960 for manufacturing equipments and spare parts. The company uses a costing system for determining product costs. The company allocates overhead costs to products based on machine hours as in table 3/2/5 as follow:

Overhead rate = Overhead costs / total machine hours = 27765/121 = 229

Overhead cost assigned = overhead rate × machine hours

Table 3/2/5: Cost per unit under company A costing system for 11/2012

Products	Direct material	Direct labour	Overhead cost assigned	Total costs	Units produced	Total cost per unit
Right- Fax	6	34	2293	2333	5	467
Lsan	17	38	4586	4642	8	580
Left-Fax	7	34	2293	2334	5	467
Kapas	7	42	3057	3106	5	621
Ruler	10	46	3784	3840	6	640
Amoud	14	32	516	562	1	562
Trus-lobad	17	75	2522	2614	2	1307
Gibt- Nhas	52	34	650	735	1	735
Kofof- A	7	47	1223	1277	4	319
Kofof- B	7	19	1223	1249	4	312
Gelba-A	70	25	535	630	1	630
Gelba-B	62	12	229	303	1	303
Gelba-C	62	27	573	662	1	662
Gelba-D	52	25	535	612	1	612
Gelba- e	13	17	382	412	1	412
Gelba-f	13	5	115	132	1	132
Gelba-g	9	7	153	169	1	169
Gelba-h	31	22	497	550	1	550
Gelba-i	13	12	268	292	1	292
Gelba-j	13	9	191	213	1	213
Gelba-k	8	5	115	128	1	128
Gelba-l	5	6	115	125	1	125
Gelba-m	5	0	115	120	1	120
Gelba-n	2	6	115	122	1	122
Lsan kamh	22	6	1682	1709	2	854
Total	523	584	27765	28872		

Source: Researcher, A Company archive data, 2013.

Whereas, application of Activity based costing (ABC) in A Company involves the following basic steps which are:

i. Identifying the major activities, creating a cost pool for each activity, and identifying measures of activities- the related cost drivers

The main activities for the company are six: (Cutting, Turnery, Freaz, Freaz CNC, whetting, and Control). The details of activities overhead cost pools & related cost drivers are in table 3/2/6& 3/2/7 as follow:

Table 3/2/6: Activity cost pools & related cost drivers

Activities	Overhead costs	Cost drivers	Use of cost drivers
Cutting	2534	No. of machine hours	4
Turnery	3439	No. of machine hours	19
Freaz	17238	No. of machine hours	13.5
FreazCNC	595	No. of machine hours	5
whetting	595	No. of machine hours	0.5
Control	3043	No. of check times	171

Source: Researcher, A Company archive data, 2013.

Table 3/2/7: Use of cost drivers in each activity for each product

Activities	Machine hours					Control
	Cutt	Turner	Freaz	Freaz CNC	Whetting	No of checks
Products						
Right- Fax	0.33		1.5			15
Lsan	0.17		2			24
Left-Fax	0.33		1.5			15
Kapas	0.33		2			15
Ruler-tathbet	0.33		2		0.25	24
Amoud	0.33	1	0.5		0.25	5
Trus-lobad	0.33	2	3			8
Glbt- Nhas	0.17	2	0.5			4

Kofof- A	0.17			1		12
Kofof- B	0.17			1		12
Gelba-A	0.17	2				3
Gelba-B		0.5	0.33			3
Gelba-C	0.17	2	0.17			4
Gelba-D	0.17	2				3
Gelba- e		1.5				2
Gelba-f		0.5				1
Gelba-g		0.5				2
Gelba-h		2				2
Gelba-i		1				2
Gelba-j		0.17				2
Gelba-k		0.5				1
Gelba-l		0.33				2
Gelba-m		0.33				2
Gelba-n		0.33				2
Lsan kamh	0.5			3		6
Total	4	19	13.5	5	0.5	171

Source: Researcher, A Company archive data, 2013.

- ii. Compute the activity overhead rates per cost drivers by divided overhead costs on use of cost driver as in table 3/2/8

Table 3/2/8: Activity overhead cost rate

Activities	Overhead costs (a)	Use of cost drivers (b)	Activity rate (a/b)
Cutting	2534	4	633
Turnery	3439	19	181
Freaz	17238	13.5	1277
FreazCNC	595	5	119
Whetting	595	0.5	1190
Control	3043	171	18

Source: Researcher, A Company archive data, 2013.

iii. Assigning the overhead costs of activities to products according to the use of cost drivers for each product

Overhead costs assigned = activity rate per each activity × use of cost drivers by each activity as in table 3/2/9.

Table 3/2/9: Overhead costs assigned

Products	Overhead assigned	Units produced	Cost per unit
Right- Fax	2391	5	478
Lsan	3089	8	386
Left-Fax	2391	5	478
Kapas	3030	5	606
Ruler-tathbet	3487	6	581
Amoud	1415	1	1415
Trus-lobad	4544	2	2272
Glb- Nhas	1179	1	1179
Kofof- A	440	4	110
Kofof- B	440	4	110
Gelba-A	523	1	523
Gelba-B	565	1	565
Gelba-C	758	1	758
Gelba-D	523	1	523
Gelba- e	307	1	307
Gelba-f	108	1	108
Gelba-g	126	1	126
Gelba-h	398	1	398
Gelba-i	217	1	217
Gelba-j	66	1	66
Gelba-k	108	1	108
Gelba-l	95	1	95
Gelba-m	95	1	95
Gelba-n	95	1	95
Lsan kamh	<u>780</u>	2	390
Total	27174		

Source: Researcher, A Company archive data, 2013.

iv. Compare the results: Traditional costing systems & ABC system:

Table 3/2/10: Overhead costs under traditional system & ABC system

Products	Units produced	Traditional system	ABC system	Difference
Right- Fax	5	459	478	-20
Lsan	8	573	386	187
Left-Fax	5	459	478	-20
Kapas	5	611	606	5
Ruler-tathbet	6	631	581	49
Amoud	1	516	1415	-899
Trus-lobad	2	1261	2272	-1011
Gibt- Nhas	1	649	1179	-530
Kofof- A	4	306	110	196
Kofof- B	4	306	110	196
Gelba-a	1	535	523	12
Gelba-b	1	229	565	-336
Gelba-c	1	573	758	-185
Gelba-d	1	535	523	12
Gelba- e	1	382	307	75
Gelba-f	1	115	108	7
Gelba-g	1	153	126	27
Gelba-h	1	497	398	99
Gelba-i	1	267	217	50
Gelba-j	1	191	66	125
Gelba-k	1	115	108	7
Gelba-l	1	115	95	20
Gelba-m	1	115	95	20
Gelba-n	1	115	95	20
Lsan kamh	2	841	390	451

Source: Researcher, A Company archive data, 2013.

Based on the above analysis, there is a significant difference in unit product cost in terms of overhead costs. ABC system has changed product costs for all products comparing with based on company's existing system which was allocated overhead according to single overhead rate (machine

hours) because of their hidden completely by the existing system. This difference leads to the same difference in profit. As indicated above with low production volume, but high cost allocation product real unit cost increased with ABC system for products (Right- Fax, Left- Fax, Amoud, Trus-lobad, Glbt- Nhas). However unit cost decreased with ABC system by products (Lsan, Kapas, Ruler-tathbet, Kofof- A, Kofof- B, Gelba-a, Gelba-d, Gelba-e, Gelba-f, Gelba-g, Gelba-h, Gelba-I, Gelba-j, Gelba-k, Gelba-l, Gelba-m, Gelba-n, Lsan kamh) because of low costs allocation . It's clear that A Company's costing system which allocated overhead costs based on single overhead rate distorted product cost, overcosted some products and undercosted other; it loads too much overhead costs on highly-volume products (e.g., Lsan, Kapas, Ruler-tathbet) and too little on low-volume products(e.g., Right- Fax, Left- Fax, Amoud, Trus-lobad, Glbt- Nhas).

b. Company B

Company B is an engineering company established in 1935 for manufacturing cooling and air conditioning products (Refrigerators, Chest Deep Freezer, Air Cooler, Water Cooler, Samsung/refrigerator, and Samsung/AC).

Table 3/2/11: Cost per unit under B company' costing system for 2012

Prod	Direct materia	Prod cost	Admin cost	Selling costs	Total cost	Units	Cost per unit
Ref	41429679	6000000	4000000	3900000	55329679	343050	158
Chest	2944692	360000	230000	210000	3744692	19172	195
Air	9053716	1500000	1000000	930000	12483716	25739000	0.5
Sam/R	14388909	250574	169754	156946	14966183	77248	194
Sam/A	27926592	689488	361815	91768	29069663	191088000	0.2
Total	95743587	6000000	4000000	3900000	115593932	343050	

Source: Researcher, B Company archive data, 2013.

The application of Activity based costing (ABC) in B Company involves the following basic steps which are:

i. Identifying the major activities, creating a cost pool for each activity, and identifying measures of activities- the related cost drivers

The main activities for the company are seven: (Material checking& receiving, Cutting1, Cutting2, Cutting3, Painting-Omsa, Foam, Assembling, Quality Control, Charging, and Selling & Distribution) as follow:

Table 3/2/12: Activities cost pools and related cost driver for year 2012

Activities	Cost drivers	Ref	Chest	Air	Sam/R	Sam/A
Material checking& receiving	No. of bond bills	√	√	√	√	√
Cutting 1	No. of machine using times		√			
Cutting 2	No. of machine using times	√				
Cutting 3	No. of machine using times			√		
Painting-Omsa	No. of machine hours	√	√	√		
Foam	No. of consumed quantities	√	√			
Assembling	No. of labour hours	√	√	√	√	√
Quality Control	No. of check times	√	√	√	√	√
Charging	No. of charging times	√	√	√	√	√
Selling & distribution	No. of sale pills	√	√	√	√	√

Source: Researcher, B Company archive data, 2013.

Table 3/2/13: Use of cost drivers for B Company for year 2012

Cost drivers	Ref	Chest	Air	Sam/R	Sam/A	Total
No. of purchases bills	113	8	25	39	76	260
No. of machine using times	1152					1152
No. of machine using times		576				576

No. of machine using times			1728			1728
No. of machine hours	1788	97	419			2304
No. of consumed quantities	30340	13722				44062
No. of labour hours	1640	406	884	872	479	4281
No. of check times	208684	11368	13966	34885	47900	316803
No. of charging times	1656	270	582	400	233	3141
No. of sale pills	3864	212	882	871	1170	7000

Source: Researcher, B Company archive data, 2013.

ii. Compute the activity overhead rates per cost drivers and assign the costs of activities to products

Table 3/2/14: activity overhead rate for B Company for year 2012

Activities	Overhead costs (a)	Use of cost drivers (b)	Activity rate (a/b)
Material checking& receiving	1399313	260	5382
Cutting 1	1406364	1152	1221
Cutting 2	1406364	576	2442
Cutting 3	1406364	1728	814
Painting-Omsa	1324109	2304	575
Foam	1348557	44062	31
Assembling	1025817	4281	240
Quality Control	1045830	316803	3
Charging	1142405	3141	364
Selling & distribution	<u>5,071,606</u>	7000	725
Total	<u>16576727</u>		

Source: Researcher, B Company archive data, 2013.

Table 3/2/15: Overhead costs assigned for B Company for year 2012

Products	Activity rate	Use of cost driver	Overhead costs assigned
<u>Refrigerator</u>			
Material checking& receiving	5382	113	608166
Cutting 2	2442	1152	2813184
Painting-Omsa	575	1788	1028100

Foam	31	30340	940540
Assembling	240	1640	393600
Quality Control	3	208684	626052
Charging	364	1656	602784
Selling & distribution	725	3864	2801400
<u>Chest Deep Freezer</u>			
Material checking& receiving	5382	8	43056
Cutting 1	1221	576	703296
Painting-Omsa	575	97	55775
Foam	31	13722	425382
Assembling	240	406	97440
Quality Control	3	11368	34104
Charging	364	270	98280
Selling & distribution	725	212	153700
<u>Air Cooler</u>			
Material checking& receiving	5382	25	134550
Cutting 3	814	1728	1406592
Painting-Omsa	575	419	240925
Assembling	240	884	212160
Quality Control	3	13966	41898
Charging	364	582	211848
Selling & distribution	725	882	639450
<u>Samsung/Ref</u>			
Material checking& receiving	5382	39	209898
Assembling	240	872	209280
Quality Control	3	34885	104655
Charging	364	400	145600
Selling & distribution	725	871	631475
<u>Sam/AC</u>			
Material checking& receiving	5382	76	409032
Assembling	240	479	114960
Quality Control	3	47900	143700
Charging	364	233	84812
Selling & distribution	725	1170	848250
Total overhead cost assigned			17213944

Source: Researcher, B Company archive data, 2013.

iii. Calculate total cost per unit as in table 3/2/16

Table 3/2/16: Cost per unit under ABC for B Company for year 2012

Products	Direct material	Direct labour	Overhead assigned	Total cost	Units	Cost per unit
Ref	41429679	1775196	9813826	53018701	349568	152
Chest	2944692	96703	1611033	4652428	19172	243
Air	9053716	415812	2887423	12356951	25739000	0.5
Sam/Re	14388909	415455	1300908	16105271	77248	208.5
Sam/AC	27926592	570454	1600754	30097800	191088000	0.2
	95743587	3273620				

Source: Researcher, B Company archive data, 2013.

iv. Compare the results: Traditional costing systems & ABC system

Table 3/2/17: Overhead cost per unit for Traditional systems and ABC system for B Company for year 2012

Cost per unit	Units produced	Traditional system	ABC system	Difference
Ref	29812	158	152	6
Chest	1624	195	243	-47
Air	6983	0.5	0.5	0
Sam/Ref	6977	194	209	-15
Sam/AC	9580	0.2	0.2	0

Source: Researcher, B Company archive data, 2013.

Based on the above analysis, there is a significant difference in unit product cost in terms of overhead costs. ABC system has changed product costs for all products comparing with based on company's existing system which was allocated overhead according to single overhead rate (units produced) because of their hidden completely by the existing system. This difference in product costs leads to the same difference in profit. As indicated above with low production volume, but high cost allocation product real unit cost increased with ABC system for products (Chest Freezer, Samsung / Ref, Samsung /AC). However, unit cost decreased with

ABC system by products (Refrigerator, Air cooler) because of low costs allocation. It's clear that B Company's costing system which allocated overhead costs based on single overhead rate distorted product cost, overcosted some products and undercosted other; it loads too much overhead costs on highly-volume products ((Refrigerator, Air cooler) and too little on low-volume products (Chest Freezer, Samsung / Ref, Samsung /AC).

c. Company C

C Company is an industrial company established in 1960 for manufacturing households (Enamel). In 2009, the company added new production lines (Stenls Steel). The types of products for the 2012 are eight products (Makab, Kora, Sukaria, Bowl, Sahan, Sinya, Kouz, Amoud). The company uses costing systems for determining cost per unit which is used for the purposes of pricing decisions. The company's cost per unit equal total marginal cost plus total fixed costs as in table 3/2/18

Table 3/2/18: Cost per unit under C Company costing system for 2012

Products	Marginal cost per unit	Fixed costs	Total cost per unit
Makab	11.8	2.5	14.3
Kora	17.3	2.5	19.8
Sukaria	0.7	2.5	3.2
Bowl	10.9	2.5	13.4
Sahan	17.5	2.5	20.0
Sinya	23.2	2.5	25.7
Kouz	1.3	2.5	3.8
Amoud	10.5	2.5	13.0

Source: Researcher, C Company archive data, 2013.

Whereas, application of Activity based costing (ABC) in C Company involves the following basic steps which are:

i. Identifying the major activities, creating a cost pool for each activity, and identifying measures of activities- the related cost drivers:

The main activities for the company are three: (Manufacturing, Polishing, and Packaging) as follow:

Table 3/219: Activity cost pools & cost drivers for C Company for 2012

Activities	Overhead costs	Cost drivers	Use of cost drivers
Manufacturing	375836	No. of machine hours	406
Polishing	403091	No. of machine hours	699
Packaging	91040	No. of cartons	6277

Source: Researcher, C Company archive data, 2013.

Table 3/2/20: Use of cost drivers for C Company for year 2012

Activities	No. of machine hours		No. of packaged cartons
	Manufacturing	Polishing	Packaging
Makab	39	67	274
Kora	64	110	498
Sukaria	20	34	54
Bowl	7	13	201
Sahan	248	427	3254
Sinya	15	26	818
Kouz	7	11	72
Amoud	<u>7</u>	<u>12</u>	<u>1106</u>
Total	406	699	6277

Source: Researcher, C Company archive data, 2013.

ii. Compute the activity overhead rates per cost drivers and assign the costs of activities to products.

Table 3/2/21: Activity overhead rate for C Company for year 2012

Activity cost	Overhead costs	No of cost drivers	Activity overhead rate
Manufacturing	375836	406	926
Polishing	403091	699	577
Packaging	91040	6277	15

Source: Researcher, C Company archive data, 2013.

Table 3/2/22: Overhead costs assigned for C Company for year 2012

Product	Manufacturing			Polishing			Packaging			Total
	M. hour	Activity rate	Overhead cost	M. hour	Activity rate	Overhead cost	No of carton	Activity rate	Overhead cost	
Makab	39	926	35737	67	577	38384	274	15	3974	78095
Kora	64	926	59146	110	577	63526	498	15	7223	129895
Sukari	20	926	18319	34	577	19675	54	15	783	38778
Bowl	7	926	6832	13	577	7338	201	15	2915	17085
Sahan	248	926	229123	427	577	246091	3254	15	47195	522409
Sinya	15	926	13896	26	577	14925	818	15	11864	40684
Kouz	7	926	6170	11	577	6627	72	15	1044	13842
Amoud	7	926	6264	12	577	6728	1106	15	16041	29033
Total			375487			403294			91040	869821

Source: Researcher, C Company archive data, 2013.

iii. Calculates cost per unit for each product as in table 3/2/23

Table 3/2/23: Cost per unit under ABC system for C Company for 2012

Products	Direct material	Direct labour	Overhead cost assigned	Total costs	Units produced	Total cost per unit
makab	60853	26384	78095	165332	25240	7
kora	124324	43667	129895	297886	41773	7

sukaria	7126	13525	38778	59429	12938	5
bowl	24199	5044	17085	46328	4825	10
Sahan	541129	169160	522409	1232698	161822	8
Sinya	97186	10259	40684	148129	9814	15
Kouz	4099	4556	13842	22497	4358	5
Amoud	<u>44682</u>	<u>4625</u>	<u>29033</u>	<u>78340</u>	4424	18
Total	903599	277219	869821	2050639		

Source: Researcher, C Company archive data, 2013.

iv. Compare the results: Traditional costing systems & ABC system:

Table 3/2/24: Cost per unit for Traditional systems and ABC for C Company for year 2012

Products	Units produced	Traditional system	ABC system	Difference
Makab	25240	14.3	7	7.3
Kora	41773	19.8	7	12.8
Sukaria	12938	3.2	5	1.8
Bowl	4825	13.4	10	3.4
Sahan	161822	20.0	8	12
Sinya	9814	25.7	15	10.7
Kouz	4358	3.8	5	1.2
Amoud	4424	13.0	18	5

Source: Researcher, C Company archive data, 2013.

Based on the above analysis, there is a significant difference in unit product cost in terms of overhead costs. This difference in product costs leads to the same difference in profit. As indicated above with low production volume, but high cost allocation product real unit cost increased with ABC system for products (Sukaria, Kouz, Amoud). However, unit cost decreased with ABC system by products (Makab, Kora, Bowl, Sahan, Sinya) because of low costs allocation. It's clear that C Company's costing system which allocated overhead costs based on single overhead rate distorted product cost, overcosted some products and undercosted other; it loads too much overhead costs on highly-volume products (e.g., Makab, Kora, Bowl,

Sahan, Sinya) and too little on low-volume products(Sukaria, Kouz, Amoud). In addition, based on the above analysis under ABC system, management will concentrate on products (Sukaria, Kouz, Amoud) rather than products (Makab, Kora, Bowl, Sahan, Sinya) as pointed out by the traditional costing systems.

d. Company D

D Company is an industrial company established in 1976 for manufacturing sugar product which is produced through several continuous production processes. The company uses a costing system for the purposes of calculated cost of products (Sugarcane, Sugar, Joint and by products); budget, variance analysis, and preparing financial statements. The company allocated overhead costs to products based on single overhead rate (units produced) as follow in table 3/2/25:

Table 3/2/25: Cost per unit for D Company for year 2012

Particular	Amount
Overhead cost	59131328
Units produced- tones(b)	<u>76708</u>
Cost per unit – tone(a/b)	771

Source: Researcher, D Company archive data, 2013.

Whereas, application of Activity based costing (ABC) in D Company involves the following basic steps which are:

i. Identifying the major activities, creating a cost pool for each activity, and identifying measures of activities- the related cost drivers

The main activities for the D company are: (Agricultural processes, Fertilizer scattering, Herbicide spraying, Irrigation processes, Canal cleaning, Sugarcane, preparing& girding, Juice processes, Sugar shaking &

packaging). The details of activities overhead costs pools and related cost drivers are in table 3/2/26 as follow:

Table 3/2/26: Activity cost pools & cost drivers for D Company 2012

Activity cost pool	Overhead costs	Cost drivers	No of cost driver
Agricultural processes	18553777	No. of acres	21975
Fertilizer scattering	1287375	No. of Fertilizer tones	43256
Herbicide spraying	1287375	No. of Herbicide liters	81818
Irrigation processes	6287375	No. of water liters	23301600
Canal cleaning	4055318	No. of alluvion liters	407407
Sugarcane preparing & girding	11361526	No. of sugarcane tones	754717
Juice processes	8371274	No. of Juice tones	60320
Sugar packaging	<u>7927308</u>	No. of sugar tones	76708
	59131328		

Source: Researcher, D Company archive data, 2013.

ii. **Compute the activity overhead rates per cost drivers and assign the costs of activities to products as in table 3/2/27**

Table 27: Activity overhead rate for D Company for year 2012

Activity cost pool	Overhead costs	Use of cost drivers per	Activity overhead rate
Agricultural processes	18553777	21975	844
Fertilizer scattering	1287375	43256	30
Herbicide spraying	1287375	81818	16
Irrigation processes	6287375	23301600	0
Canal cleaning	4055318	407407	10
Sugarcane preparing & girding	11361526	754717	15
Juice processes	8371274	60320	139
Sugar packaging	<u>7927308</u>	76708	<u>103</u>
Cost per unit			<u>1157</u>

Source: Researcher, D Company archive data, 2013.

iii. Compare the results: Traditional costing systems and ABC:

Table 3/2/28: Cost per unit for Traditional systems and ABC system for D Company for year 2012

	Traditional system	ABC system	Difference
Sugar	771	1157	386

Source: Researcher, D Company archive data, 2013.

Based on the above analysis, there is a significant difference in products costs per unit for two products. The cost per unit under ABC system (1157) is greater than (771) under traditional system. This difference in product costs leads to same difference in net profit.

e. Company E

E Company is an industrial company established in 2004 for manufacturing poultry products (chicks & chicken meat). The main and final product is (chickens). The company uses costing system for determining cost per unit. The company allocated overhead costs to products based on single overhead rate (units produced) as follow in table 3/2/29.

Table 3/2/29: Cost per unit for E Company for year 2012

Particular	
Direct material	1371590
Indirect costs	<u>1413888</u>
Total costs (a)	2785478
No. of hatches	<u>338</u>
Cost of hatch	3611.2
Units produced (b)	<u>9386152</u>
Cost per unit (a/b)	<u>0.297</u>

Source: Researcher, E Company archive data, 2013.

Whereas, application of Activity based costing (ABC) in E Company involves the following basic steps which are:

ii. Identifying the major activities, creating a cost pool for each activity, and identifying measures of activities- the related cost drivers

The main activities for the company are eight: (Receiving, Vaporization, Incubation, Checking, Hatching, Sorting & Packing, Immunization, and Getting rid of garbage. Activities overhead cost pools and related cost drivers are in table 3/2/30:

Table 3/2/30: Activities and related cost drivers for E Company for 2012

Activities	Overhead costs	Cost drivers	No of cost drivers
Eggs receiving	62424	No. of receiving times	355
Eggs vaporization	56436	No. of vaporization times	338
Eggs incubation	160043	No. of incubation times	338
Edge checking	38855	No. of checking times	338
Eggs hatching	612259	No. of hatching times	338
Chicken sorting & packing	101352	No. of packing times	338
Chicken immunization	67945	No. of immunization times	338
Getting rid of garbage	121257	No. of getting rid of garbage times	338

Source: Researcher, E Company archive data, 2013.

iii. Compute the activity overhead rates per cost drivers and assign the costs of activities to products as in table 3/2/31

Table 3/2/31: Activity rate & overhead for E Company for 2012

Activities	Overhead costs (a)	Use of cost drivers (b)	Activity rate (a/b)
Eggs receiving	62424	355	176
Eggs vaporization	56436	338	167
Eggs incubation	160043	338	474
Edge checking	38855	338	115
Eggs hatching	612259	338	1811

Chicken sorting & packing	101352	338	300
Chicken immunization	67945	338	201
Getting rid of garbage	121257	338	<u>359</u>
Cost of hatch (a)			3602
No. of hatches (b)			<u>338</u>
Overhead costs assigned (a*b)			1217582

Source: Researcher, E Company archive data, 2013.

iv. Calculates cost per unit (chicks) as in table 3/2/32

Table 3/2/32: Cost per unit under ABC system for E Company for 2012

Particular	
Direct material	1371590
Direct labour	193316
Overhead costs assigned	<u>1217582</u>
Total costs	2782488
Units produced	<u>9386152</u>
Cost per unit	<u>0.296</u>

Source: Researcher, E Company archive data, 2013.

v. Compare the results: Traditional systems & ABC system:

Table 3/2/33: Cost per unit for Traditional systems and ABC system for E Company for 2012

Cost per unit (tone)	Traditional system	ABC system	Difference
Hatch	3611	3602	9
Chicks	0.297	0.296	0.1

Source: Researcher, E Company archive data, 2013.

Based on the above analysis, there is insignificant difference in products costs per unit for two systems. The cost per unit (hatch) under existing system (3602) is greater than ABC system (3611); and also the cost per unit (Chicks) under ABC system (0.296) is less than (0.297) under traditional system. This leads to difference in profit by (0.1). These results answer the study questions and confirm the study hypotheses that ABC system provide accurate cost information; and enhances performance.

3.2.1.2 Summary

The table 3/2/34 summarizes the comparison between traditional costing systems & ABC for all companies as follow:

Table 3/2/34: Summary of Cost per unit for Traditional systems & ABC system for (A, B, C, D, E) Companies for 2012

	Traditional system	ABC system	Difference
Company A			
Right- Fax	459	478	-20
Lsan	573	386	187
Left-Fax	459	478	-20
Kapas	611	606	5
Ruler-tathbet	631	581	49
Amoud	516	1415	-899
Trus-lobad	1261	2272	-1011
Gibt- Nhas	649	1179	-530
Kofof- A	306	110	196
Kofof- B	306	110	196
Gelba-a	535	523	12
Gelba-b	229	565	-336
Gelba-c	573	758	-185
Gelba-d	535	523	12
Gelba- e	382	307	75
Gelba-f	115	108	7
Gelba-g	153	126	27
Gelba-h	497	398	99
Gelba-i	267	217	50
Gelba-j	191	66	125
Gelba-k	115	108	7
Gelba-l	115	95	20
Gelba-m	115	95	20
Gelba-n	115	95	20
Lsan kamh	841	390	451
Company B			
Ref	158	152	6
Chest	195	243	-47

Air	0.5	0.5	0
Sam/Ref	194	209	-15
Sam/AC	0.2	0.2	0
Company C			
Makab	14.3	7	7.3
Kora	19.8	7	12.8
Sukaria	3.2	5	1.8
Bowl	13.4	10	3.4
Sahan	20.0	8	12
Sinya	25.7	15	10.7
Kouz	3.8	5	1.2
Amoud	13.0	18	5
Company D			
Sugar	771	1157	386
Company E			
Chicks	0.297	0.296	0.1

Source: Researcher, Companies archive data, 2013.

As can be seen in Table 3/2/34, more than a half companies (4 out of 5) have a significant difference in products costs per unit between company's costing systems and ABC system for companies (A,B,C,D); and insignificant difference in products costs for Company E. ABC system has changed all products costs completely different comparing with the traditional costing system, that the companies currently used. Company's costing systems allocated overhead costs according to single overhead rate (units produced) for Companies (B,C,D,E) and (machine hours) for Company A. In contrast, based on the results on table 3/2/34, the adoption of ABC system determines product cost more accurately than company's costing system because it classified the overhead cost on activities and used multiple cost driver rather than one cost driver (machine hours or units produced) in traditional or existing costing system. This difference in product costs between ABC system and companies costing system leads to same difference in net profit. As seen in table 3/2/34, the costs of many

products with ABC system are less than traditional costing system, that the companies currently used by more than a half companies (A, B, C, & D). Consequently, the net profit by ABC system is greater than traditional costing systems. It can be concluded that many products are more profitable by ABC system than traditional system by more than half companies.

3.2.1.3 Qualitative data (Interviews) analysis

a. Descriptive analysis

The first part of the interview analysis provides a descriptive overview of the interviewees and the companies under study. This information enables understanding of the background of respondents and their respective companies. Table 3/2/35 reveals the profile of the interviewees who participated in the interview. First, work position for interviewees in Companies (A, B, C, D) were heads of cost accounting departments, whereas, Company E was financial manager. Second, interviewees were asked to reveal their academic qualifications. Company A & B interviewees held postgraduate degrees (Master), Company C interviewee held undergraduate degrees (Bachelor), Company D interviewee held postgraduate degrees (PhD degree), and Company E interviewee held postgraduate degrees (Master & ACCA). Finally, experience years, Company A & C interviewees had worked less than ten years. Company B, D & E interviewees had worked less than 15 years. It can be concluded that interviewees have enough high academic, professional and occupational qualifications; and have enough knowledge in the area of study cost and management accounting.

Table 3/2/35: Profile of interviewees

Company Name	Work Position
A	Head of cost accounting department
B	Head of cost accounting department
C	Head of cost accounting department
D	Head of cost accounting department
E	Financial manager
	Academic Qualifications
A	Master degree
B	Master degree
C	Bachelor degree
D	PhD degree
E	Master degree & ACCA
	Experience in company
A	5-10
B	10-15
C	5-10
D	10-15
E	10-15

Source: Researcher, 2013.

b. Company characteristics

The second part presents four sets of responses relating to the companies characteristics as in table 3/2/36. Interviewees were asked to indicate in which of 8 manufacturing industries sub-sectors their companies lay. Company A was in metallic mineral products industry, Company B was in manufactured metallic products and equipments industry, Company C was in non-metallic mineral products industry. Companies D & E were in food industry. Concerning the number of employees employed in these companies, Company A were 540 employees; Company B were 341 employees, Company C were 150 employees; Companies D were 1571 employees; and Company E were 500 employees. In addition, the number of cost/ management accountants in the companies. Company A employed (2)

cost accountants; Company B (3) cost accountants; Company C (1) cost accountant, Company D employed (7) cost accountants; and Company E employed (10) cost accountants. Concerning the level of overhead cost in total costs, Company A overhead rate was 95% of total cost; Company B was 15%; Company C was 40%; Company D was 58%; and Company E was 51%.

Finally, classification of the companies based on product diversity as measured by the number of products they produced, Company A produced more than 100; Company B produced less than 10 products; C produced more than 20 products; Company D produced one product; and company E produced more than 10 products. It can be concluded that most companies (A, B, C, E) produced multiple products.

Table 3/2/36: Company characteristics

Company Name	Manufacturing sub-sector
A	Metallic mineral products industry
B	Manufactured Metallic equipments industry
C	Non-metallic mineral products industry
D	Food industry
E	Food industry
	No. of employees
A	540
B	341
C	150
D	1571
E	500
	No. of cost/management accountants
A	2
B	3
C	1
D	10
E	7
	Overhead as a percentage of total cost
A	96%

B	15%
C	40%
D	58%
E	51%
	No. of products
A	150
B	5
C	21
D	1
E	10

Source: Researcher, 2013.

c. General information about costing systems:

The third part is related to general information about companies costing systems as in table 3/2/37. It includes three sets of responses relating to the companies. First, interviewees were asked to indicate if they have department for costing system. All companies have a department for costing system except company B. Second, the nature of relation of costing system with financial accounting system, Company C & E have a separated costing system, whereas, Company A, B & D their costing system incorporated in financial accounting system.

Third, the types of cost and management accounting systems, Company A used absorption costing, process costing, job costing, budget; Company B used absorption costing & budget; Company C used absorption costing & budget; Company D used absorption costing, budget and break even point analysis; Company E used absorption costing, process costing, budget, and break even point analysis. Therefore, the cost and management systems used are traditional systems which are absorption costing; budget; break even point analysis; process costing, and job costing. And the most systems used are absorption costing; budget.

Fourth, concerning the purposes of costing system, Company A used costing system mainly for making pricing decisions and cost control. Company B for cost control; preparing financial statement (stock valuation); product profitability analysis and making decisions such pricing, make or buy, adding or dropping products, lines, or departments, and introducing new markets. Company C for cost reduction; cost control; budget; product profitability analysis and making decisions such pricing, make or buy, adding or dropping products, lines, or departments, and introducing new markets, performance measurement. Company D for cost control and pricing decisions, Company E for cost reduction; cost control; preparing financial statement (stock valuation); product profitability analysis and making decisions such pricing, make or buy, adding or dropping products, lines, or departments, and introducing new markets. Therefore, the main purposes of costing systems for the study sample are: cost control, pricing decisions, budget preparation, make or buy decisions, add or drop decisions, and introducing new markets decisions.

Table 37: General information about costing system

Department of cost accounting	Company Name
Special department for cost accounting	A , C, D, E
No special department for cost accounting	B
Nature of cost accounting system	
Costing system incorporated in financial accounting system	A, B, D
Costing system separated from financial accounting system	C, E
The cost/ management accounting systems used	
Absorption costing	A, B, C, D, E
Process costing	A, D, E

Job costing	A
Budget	A, B, C, D, E
Break even point analysis	A, D
Purposes of costing system	
Cost reduction	C,E
Cost control	A, B, C, D, E
Preparing financial statements (stock valuation)	B, E
Performance measurement	B, E
Budget	A,C, E
Product profitability analysis	B, E
Pricing decisions	A,B,C,D, E
Make or buy decisions	B, C, E
Adding and dropping products, product line or department decisions	B, C, E
Introducing\g markets decisions	B, C, E

Source: Researcher, 2013.

d. The adoption of ABC system

Turning to the main focus in this study, the adoption of ABC system by study' selected sample. The table 3/2/38 shows two set of responses. First, the current status of ABC adoption, companies A, C, & E have not adopted and implemented ABC system yet. Company B adopted (not implemented) ABC system and then rejected. Company D has begun to adopt and implement ABC system. There is no company from the study sample currently adopting and implementing ABC system.

Second, with regard to the motives and reasons for adopting or intending to adopt ABC system in the near future, all companies (A ,B,C, D,

E) intend to adopt ABC system for the reasons of existing costing system did not provide information to determine the cost of various activities performed in the company easily; the changing manufacturing environment and cost structure created the need to improve and update the existing costing systems to support managerial decisions followed by ABC system improves product cost information which would give the company competitive advantage and the existing costing system was not reliable.

e. The factors influence adoption of ABC system

i. **Cost structure** (potential for cost distortion): The cost structure factor was measured by overhead costs as percentage of total costs. Based on the table, Company A the level of overhead was 95% of total cost; Company B was 15%; Company C was 40%; Company D was 58%; and Company E was 51%. It can be concluded that overhead costs are high by more than half selective sample (4 out of 5) and then the use of traditional costing systems is inappropriate and may results in reporting serious distorted product cost information.

ii. **Importance of cost information:** Four questions were used to measure the importance of cost information. The table showed that the selective sample use cost information mainly for cost control and pricing decisions followed by competition and cost reduction efforts. It can be concluded that from the responses for the related questions to this factor, the cost information is vital important for all sample study companies.

iii. **Products diversity:** Product diversity was measured by interviewees five question, three questions for volume diversity and two for support diversity. Based on the descriptive analysis (number of products) in table 3/2/36 and interviewees' responses in table 3/2/38 relating to volume diversity, most of selective sample companies (4 out of 5) have multiple products; and a

different in products lines and products lots sizes and volume. While, support diversity, all companies' products require similar resources to be manufactured, designed, and distributed and costs of support departments are same for each product line. Therefore, based on the above analysis, it can be concluded that the most of selective sample does not have highly diversity products. This reflects the nature of manufacturing environment in Sudan which is simple to some extent.

iv. Intensity of Competition: Concerning the competition factor, four questions were used to measure the intensity of competition faced by interviewees' companies. Based on the interviewees responses, most of selective companies (B,D, E) faced intensive competition with regard to three elements: price, product and market, whereas, Company A& B were not faced any intense in competition. It can be concluded that more than half of selective sample companies faced intensive competition. Therefore, the use of modern costing system which provides more accurate product cost information may be appropriate and important for competition purposes.

It can be concluded that the main factors influence the application of ABC system by most of selective sample companies are: cost structure, importance of cost information, intensity of competition.

f. The difficulties associated application of ABC system and reasons for non application

Based on the above analysis in table 3/2/38 with regard to the difficulties and reasons for non adoption, the main difficulties and reasons for non-adoption are: (a) Lack adequate resources (ABC skills or ABC knowledge); (b) Insufficient support from top management; (c) Complexity nature of ABC system with regard to determining activity cost pools and suitable cost drivers; (d) Increased workload of cost/ management accountants; (e) High

costs (including cost of IT) of ABC implementation; (f) Resistance to change by the management/ employees; (g) Satisfaction with current systems; (h) Pricing decision based on other economic factors (supply, demand, and competition) than cost. Special difficulties and reasons for non adoption of ABC system are: (a) No special cost accounting department; (B) the company does not operate in a very competitive environment, so an ABC system is not required.

Table 3/2/38: The adoption of ABC system

The current status of ABC adoption by companies	Company Name
The company has not adopted or implemented ABC system	A , C, E
The company adopted (not implemented) ABC system and then rejected	B
The company has currently implemented ABC system	-
The company has begun to adopt and implement ABC system	D
The company plans to adopt and implement ABC system in the near future	-
Reasons for adopting ABC system	
The existing costing system was not reliable and useful information for managerial decision.	A, C
The existing costing system did not provide information to determine the cost of various activities performed in the company easily.	A ,B,C, D, E
The changing manufacturing environment and cost structure created the need to improve and update the existing costing systems to support managerial decisions	A,B,C, D, E
ABC system improves product cost give the company competitive advantage.	B, D, E
Importance of cost information	
Product costs information must be highly reliable for competition purposes	B, D, E

Operating costs data is extremely important in cost reduction efforts	C,E
Product costs are very important for the purpose of cost control	A,B,C,D, E
Cost information is the most important factor when making decisions such pricing, make or buy, add or drop products, lines, markets	A, B,C, D, E
Product diversity	
Product lines are more quite different	A,B,C,E
Most products are different in product volumes or lot sizes	A, B,C, E
Most products require similar resources to be manufactured, designed, and distributed	A,B, C,D, E
The costs of support departments (e.g., engineering, purchasing, marketing) are about the same for each product line)	A, B, C, D,E
Competition	
The level of competition for your products has significantly increased over the past 10 years	B,D, E
Price competition within this industry is extremely intense	B,D, E
The level of competition in the market for the major products of your products is extremely intense.	B,D,E
Difficulties associated with ABC adoption or reasons for non adoption	
High costs (including cost of IT) of ABC implementation	A , E
Complexity nature of ABC system with regard to determining activity cost pools and suitable cost drivers	A, B,E
Insufficient support from top management	A,B,D
No special cost accounting department	B
Lack of adequate resources to effectively implement ABC (ABC knowledge, ABC skills or experts)	B,C, E
Lack of ABC knowledge by management, accounting & employees staff	A,B,C, D, E
Increased workload of cost/ management accountants	A,B
Resistance to change by the management/ employees	A,B,D
Satisfaction with current costing system	A, B, E
Pricing decision based on other economic factors (supply,	D, E

demand, competition) than cost	
The company does not operate in a very competitive environment , so an ABC system is not required	E

Source: Researcher, 2013.

g. Company Size

The size of company was measured by asking the interviewees to indicate the number of employees who work in their companies from four categories, less than 24 employees is small, between 25-49 is medium, between 50 – 100 is large company and more than 100 is very large company. The descriptive analysis showed that Company A has 500; Company B have 341; Company C have 150; Company D 1571; Company 500. It can be seen that all companies employed more than 100 employees. Therefore, the adoption of modern costing systems as ABC system may be appropriate because larger companies may have greater resources facilitate the adoption of modern costing systems such ABC system. The Company D has begun adoption and implementation of ABC system because is a very large company because their employee more than 100 and it has a largest number of employees (1571) among the study sample companies. Theses results are largely confirmatory with prior studies: Krumwiede; Baird et al.; Al-Omiri & Drury; Abusalama, which found that large companies were more likely to apply ABC system than small companies.

3.2.2 Hypotheses Testing

Quantitative (objective data “archive costing data”) and qualitative data (interview) were used to test the hypotheses to see whether or not the sample data support the hypotheses about the study’s sample.

3.2.2.1 Testing the first hypothesis: Qualitative (interview) data were used to test this hypothesis.

H1: SMCs do not apply ABC system.

Based on the above analysis in table 3/2/38, it can accept this hypothesis that SMCs do not apply ABC system. There is no company from the study sample currently apply ABC system.

3.2.2.2 Testing the second hypothesis: Qualitative (interview) data were used to test this hypothesis.

H₁: There is a positive relationship between factors of (cost structure, importance of cost information, product diversity, and competition) and application of ABC system by SMCs

This hypothesis consists of four sub-hypotheses. First hypothesis tests the relationship between cost structure or (potential for cost distortion) and application of ABC system. From the results analysis above as in table that, it can accept this hypothesis because most of selective sample companies have high overhead cost in total cost. Therefore, the use of ABC system may not results in product cost distortion. In addition, based on the above analysis of comparison results between traditional costing system and ABC system as in table 3/2/34 revealed that ABC system that provide accurate product cost information. Consequently, this hypothesis is accepted. The Findings of the following previous studies are consistent with the results of this study: Krumwiede; Bjornenak; Maelah, & Ibrahim; Abusalama; Cinquini et al.; Dhu et al.

Second, based on the interview analysis above in table 3/2/38, there is a positive relationship between important of cost information and application of ABC system. Accordingly, as cost information becomes important to the company, the need for more accurate cost information will increase.

Therefore, the company will apply modern costing system. As a result, this hypothesis is accepted. This is consistent with the findings of Swenson; Krumwiede; Cagwin & Bouwman; Baird et al.; Maelah, & Ibrahim; Dosch, & Wilson; Al-Omiri & Drury; Cinquini, L., et al.; Nancy; Omiri,.

Third, product diversity, as in the above analysis in table 3/2/38, product diversity was not highly among most of selective sample companies. Therefore, this hypothesis is rejected. This finding is consistent with the findings of some previous studies: Bjornenak; Al-Omiri & Drury; and Cinquini, et al.; Nancy that there is no positive relationship between product diversity and application of ABC system.

Fourth, intensity of competition, the analysis revealed that most of selective sample companies faced intensity in competition. Consequently, this hypothesis is accepted. This finding is consistent with the findings of some previous studies: Malmi; Al-Omiri & Drury.

It can be concluded that there is a significant positive relationship between application of ABC system and factors of (cost structure, importance of cost information and intensity of competition).

3.2.2.3 Testing the third hypothesis: Objective (quantitative-archive) data were used to test this hypothesis.

H₃: There is a positive relationship between application of ABC system and enhancement in financial performance

Also, objective data were used to test this hypothesis. As can be seen in results analysis above in table 3/2/34 that, it can accept this hypothesis, because the application of ABC system on selective sample companies determines product cost more accurately than companies costing system because it classified the overhead cost on activities and used multiple cost driver rather than one cost driver (machine hours or units produced) in

traditional or existing costing system. This difference in product costs between ABC system and companies costing system leads to same difference in net profit. It's clear that the costs of many products with ABC system are less than traditional costing system, that the companies currently used by more than a half companies (A, B, C, & D). Consequently, the net profit by ABC system is greater than traditional costing systems. It can be concluded that many products are more profitable by ABC system than traditional costing system by more than half companies. In addition, ABC system provides details information on activities (value added and non value added) that can companies reduce costs by eliminating activities that do not add value and increasing the efficiency of existing activities; controlling costs and enhancing pricing strategy to improve performance. These results answer the study question and confirm the suggestion that the use of ABC system enhances company performance and these are largely are largely confirmatory of those of prior studies that ABC significantly improves company performance in terms of accounting-based measures, for example, Kennedy, & Affleck-Graves; Cagwin, & Bouwman; AL-Kadash, & Ferdium; El shesheni; Hughes.

3.2.2.4 Testing the fourth hypothesis: Qualitative (interview) data were used to test this hypothesis.

H₄: There are problems and difficulties associated with application of ABC system and non-application by SMCs.

From the results analysis above that, it can accept this hypothesis. There are significant difficulties associated with ABC application and reasons for non- application of ABC system. These findings are largely confirmatory of those of prior studies as follow: (a) Lack of adequate

resources (ABC skills and ABC knowledge): Cobb et al.; Al-Basteki & Ramadan; Innes et al.; Cohen et al.; Dayfullah; Sartorius et al.; Lada. (b) Insufficient support from top management: Sartorius et al.; Sanford; Innes et al.; Lawson; Cohen et al.; Omiri. (c) Complexity nature of ABC system with regard to determining activity cost pools and suitable cost drivers: Cobb et al.; Al-Basteki & Ramadan; Innes et al.; Sartorius et al.; Abusalama; Sanford. (d) Increased workload of cost/ management accountants: Al-Basteki & Ramadan (e) High costs (including cost of IT) of ABC implementation: Dayfullah; Sartorius et al.; Abusalama; Innes et al.; Lawson; Cohen et al.; Lada; Omiri. (f) Satisfaction with current systems: Al-Basteki & Ramadan; Innes et al.; Cohen et al.; Abusalama; Lada; Rasiah; Omiri. (g) Resistance to change by the management/ employees: Al-Basteki & Ramadan; Innes et al.; Cohen et al.; Sartorius et al.; Lada; Omiri. (h) Pricing decision based on other economic factors (supply, demand, and competition) than cost: Sartorius et al.; (i) No special cost accounting department: Al-Basteki & Ramadan (j) The Company does not operate in a very competitive environment, so an ABC system is not required: Nancy. The table 3/2/39 summarizes the statement of hypotheses testing.

Table 3/2/39: Summary of hypotheses testing

No	Statement of hypotheses	Result
H1	SMCs do not apply ABC system	Accepted
<i>H2a</i>	There is a positive relationship between cost structure and application of ABC system by SMCs	Accepted
<i>H2b</i>	There is a positive relationship between importance of cost information and application of ABC system by SMCs	Accepted
<i>H2c</i>	There is a positive relationship between product diversity and application of ABC system by SMCs	Rejected
<i>H2d</i>	There is a positive relationship between competition	Accepted

	and application of ABC system by SMCs	
H3	There is a positive relationship between application of ABC system and enhancement in financial performance	Accepted
H4	There are significant problems and difficulties associated with application and non- application of ABC system by SMCs	Accepted

Source: Researcher, 2013.

3.2.3 Findings Discussion

As seen in the interview results, despite the importance of modern cost and management systems in new business environment which face fierce competition, high level of overhead costs and high use of technology. A majority of Sudanese manufacturing companies used traditional costing systems or financial accounting system for determining product cost information. In addition, they used traditional cost and management accounting systems such as budget, and break even point analysis rather than modern system such activity based costing, target costing, total quality management. These results are consistent with other previous studies which show that the use of traditional costing systems is still important than modern systems such as ABC system, especially in the developing countries due to the relatively under-developed status of economic and business administration in less developed countries. Among those are: Al-Basteki & Ramadan; Lin & Yu; UYAR; El-Mlaham; Lado; Nancy.

The adoption rate of ABC system among the selective sample is nothing; there is no company of study's sample currently adopting and implementing ABC system; one company (D) has begun the adoption of ABC system. These results are consistent with recent studies conducted in the Sudan which found that ABC system is not being adopted or

implemented by Sudanese companies (e.g., Faisal; Lada; Al-Nieel,). Therefore, the hypothesis 1 is accepted that SMCs do not apply ABC system.

The main reasons for adopting or intending to adopt ABC system in the near future are: ABC system provides information to determine the cost of various activities performed in the company easily; the changing manufacturing environment and cost structure created the need to improve and update the existing costing systems to support managerial decisions followed by ABC system improves product cost information which would give the company competitive advantage and the existing costing system was not reliable. These results are consistent with some previous studies are: Innes and Norris; Cohen et al.; Sartorius et al., Abusalama; Omiri; Lado.

With regard to the factors influence the adoption of ABC systems among SMCs, cost structure (potential for cost distortion) factor has positive impact of the adoption of ABC system because the overhead costs are high in total cost structure by more than half selective sample (4 out of 5) and then the use of traditional costing systems is inappropriate and may results in reporting serious distorted product cost information. Therefore, the hypothesis 2a is accepted.

Concerning the importance of cost information factor, the result showed that the importance of cost information has a positive impact of adoption of ABC system because the cost information is vial important for the purposes of competition, cost control ; cost reduction efforts and taking decisions such as pricing, make or buy, introducing new products, add or drop products, lines, markets. Therefore, the hypothesis 2b is accepted.

Product diversity has not a positive relationship with adoption of ABC system because the all selective sample does not have highly diversity

products with regard to support diversity. All companies' products require similar resources to be manufactured, designed, and distributed and costs of support departments are same for each product line. Concerning the volume diversity most of selective sample companies (4 out of 5) have multiple products; and a different in products lines and products lots sizes and volume. Therefore, this hypothesis 2c is rejected.

Concerning the competition factor, it has positive significant relationship with adoption of ABC system because most of selective companies (B,D, E) faced intensive competition with regard to three elements: price, product and market. Therefore, the use of modern costing systems may be appropriate to provide accurate product cost information which gives companies competitive advantage.

The study attempt to link company size as a control variable to adoption of ABC system and financial performance, the results show that all study sample companies are large, therefore, they more greater resources to adoption more modern and sophisticated costing system to provide more accurate cost information which provide significant opportunists to improve financial performance through reducing cost and increasing profit. With reference to table 3/2/34 the application of ABC system on sample companies revealed accurate product cost calculation, product cost is reduced and consequently profit is increased. Theses results are largely confirmatory with prior studies: Krumwiede; Baird et al.; Al-Omiri & Drury; Abusalama, which found that large companies were more likely to adopt ABC system than small companies.

As can be seen in Table 3/2/34, more than a half companies (4 out of 5) have a significant difference in products costs per unit between company's costing systems and ABC system for companies (A,B,C,D); and

insignificant difference in products costs for Company E. ABC system has changed all products costs completely different comparing with the traditional costing system, that the companies currently used. Company's costing systems allocated overhead costs according to single overhead rate (units produced) for Companies (B,C,D,E) and (machine hours) for Company A. As indicated above with low production volume, but high cost allocation product real unit cost increased with ABC system. However, unit cost product decreased with ABC system because of low costs allocation. Companies' existing costing systems distort product cost, overcosted some products and undercosted other products; Company A, costing system loads too much overhead costs on highly-volume products, (e.g., Lsan, Kapas, Ruler-tathbet) and too little on low-volume products(e.g., Right- Fax, Left-Fax, Amoud, Trus-lobad, Glbt- Nhas); Company B: too much for products (Refrigerator, Air cooler) and too little on products (Chest Freezer, Samsung / Ref, Samsung /AC). Company C: it loads too much overhead costs on products (Makab, Kora, Bowl, Sahan, Sinya) and too little on products (Sukaria, Kouz, Amoud); Company D: too little cost (Sugar). It can be concluded that traditional costing systems provide significant product cost distortion for more than a half companies (A, B, C, & D). In contrast, based on the results on table 3/2/34, the adoption of ABC system determines product cost more accurately than company's costing system because it classified the overhead cost on activities and used multiple cost driver rather than one cost driver (machine hours or units produced) in traditional or existing costing system. This difference in product costs between ABC system and companies costing system leads to same difference in net profit. As seen in table 3/2/34, the costs of many products with ABC system are less than traditional costing system, that the companies currently used by

more than a half companies (A, B, C, & D). Consequently, the net profit by ABC system is greater than traditional costing systems. It can be concluded that many products are more profitable by ABC system than traditional costing system by more than half companies. In addition, ABC system provides details information on activities (value added and non value added) that can companies reduce costs by eliminating activities that do not add value and increasing the efficiency of existing activities; controlling costs and enhancing pricing strategy to improve performance.

It can be concluded that ABC system enhances the accuracy of product cost information which provides significant opportunities to improve performance. Therefore, the hypothesis 3 is accepted. These results are largely confirmatory of those of prior studies that ABC significantly improves company performance in terms of accounting-based measures, for example, Kennedy, & Affleck-Graves; Cagwin, & Bouwman; AL-Kadash, & Ferdium; El shesheni; Hughes.

The main difficulties and problem associated with application of ABC system are technical issue such as identify the major activities that take place in company; assign resources to those activities; aggregate activities to create cost pools/ activity centers; determine the cost drivers for each activity; assign the cost of activities to cost objects. The interview results reveal the main difficulties and reasons for non adoption of ABC system are:

- (a) High costs (including cost of IT) of ABC implementation: Dayfullah; Sartorius et al.; Abusalama; Innes et al.; Lawson; Cohen et al.; Lada; Omiri.
- (b) Complexity nature of ABC adoption: Cobb et al.; Al-Basteki & Ramadan; Innes et al.; Sartorius et al.; Abusalama; Sanford.
- (c) Lack of adequate resources (ABC knowledge) : Cobb et al.; Al-Basteki & Ramadan; Innes et al.; Cohen et al.; Dayfullah; Sartorius et al.; Lada.
- (d) Insufficient

support from top management: Sartorius et al.; Sanford; Innes et al.; Lawson; Cohen et al.; Omiri. (e) Increased workload of cost/ management accountants: Al-Basteki & Ramadan. (f) Satisfaction with current systems: Al-Basteki & Ramadan; Innes et al.;Cohen et al.; Abusalama; Lada; Rasiah; Omiri. (g) Resistance to change by the management/ employees: Al-Basteki & Ramadan; Innes et al.; Cohen et al.; Sartorius et al.; Lada; Omiri.

CHAPTER FOUR
FINDINGS, RECOMMENDATION, & FUTURE
RESEARCH

SECTION ONE

FINDINGS

This study aims to investigate the impact of activity based costing (ABC) and financial performance enhancement by investigating the effect of some successful factors on adoption of ABC system among SMCs. In addition, the study seeks to identify the difficulties or problems associated with application of ABC system and reasons for non- application. The used a descriptive analytical method to analyze quantitative and qualitative data. Quantitative data were collected from archive accounting data (cost sheets) for the year 2012. Quantitative data analyzed based on “Cooper’ model” to apply ABC system. Qualitative data were collected by using semi-structured interview for the study’s sample. The studies reached to the following findings are as follow:

- a.** A majority of selective sample of manufacturing companies in Sudan used traditional cost and management accounting systems such as absorption costing, budget, and break even point analysis rather than modern systems such as Activity based costing.
- b.** Activity based costing (ABC) is not being applied currently by SMCs.
- c.** SMCs apply or intend to apply ABC system in the near future for the reasons of: ABC system determines the cost of various activities performed in the company easily; the requirement of new manufacturing environment and cost structure to update the existing costing systems for more accurate cost information to support managerial decisions and to give competitive environment.

- d.** The application of ABC system on SMCs determined product cost more accurately which enhanced financial performance through reduced cost and increased profit. In addition, ABC system identified details information about activities costs and cost drivers which provide significant opportunities for improving activities and processes.
- e.** Factors of (cost structure, importance of cost information and competition) have positive impact on the application of ABC system among SMCs; whereas, product diversity has not a positive relationship with application of ABC system
- f.** The main difficulties with ABC application among SMCs are:
 - Lack of adequate resources (ABC skills & ABC knowledge);
 - High costs (including cost of IT) of ABC application;
 - Complexity nature of ABC application;
 - Insufficient support from top management;
 - Increased workload of cost/ management accountants;
 - Satisfaction with current systems; and
 - Resistance to change by the management/ employees.

SECTION TWO

RECOMMENDATIONS & FUTURE RESEARCH

4.1 RECOMMENDATIONS

According to the above study findings, the following are suggested:

- a.** There is a great need for adopting and implementing ABC system to provide more accurate cost information by manufacturing companies.
- b.** Train employees with courses to enhance their skills and experience in dimensions of activity based costing to meet the work requirements in the new business environment.
- c.** Activate the role of the modern costing systems such as activity based costing more by universities and high educational institutes to raise the level of awareness.

4.2 Future Research

- a.** The impact of organizational, behavioral, and contextual factors on application of ABC system on a large sample of manufacturing companies.
- b.** The motives, benefits, and difficulties associated with application of ABC system by Sudanese companies.
- c.** The integration of ABC system with other modern cost and management system such total quality management (TQM), Just in time (JIT), target costing (TC) in evaluating manufacturing units performance

REFERENCES

1. القرآن الكريم

2. المراجع باللغة العربية- الدوريات

- رياض مصلح ضيف الله، الصعوبات التي تواجه تطبيق نظام التكاليف على اساس النشاط في الشركات الصناعية الاردنية،مجلة المحاسبة والادارة والتأمين، العدد الثامن والستون، السنة السادسة والأربعون، جامعة القاهرة، كلية التجارة، 2007، ص ص. 701-665.
- حاتم محمد عبدالرؤوف الشيشيني، ممارسات المحاسبة الادارية: العوامل المؤثرة عليها وأثرها على مستوى أداء المنشآت، مجلة المحاسبة والادارة والتأمين، العدد الواحد والسبعون، السنة السابعة والأربعون، الجزء الأول، جامعة القاهرة، كلية التجارة، 2008، ص ص. 555-487.
- عدنان بن عبدالله الملحم، تطبيق أساليب المحاسبة الادارية في المنشآت الصناعية في المملكة العربية السعودية، مجلة المحاسبة والادارة والتأمين، العدد الواحد والستون، السنة الثانية والأربعون، جامعة القاهرة، كلية التجارة، 2003، ص ص. 325-297.

3. ENGLISH LANGUAGE REFERENCES

3.1 BOOKS

- Arora, M.N, Cost accounting: Principles & Practice, 9th ed, Vikas Publishing House PVT Ltd, New Delhi, 2006.
- Atrill, P., & E. McLaney, Management accounting for decision makers, 4th ed, FT Prentice Hall, Pearson education, New York, 2005.
- Anthony, A.A., R.D. Banker, R.S. Kaplan, & S.M. Young, Management Accounting, 3rd ed, Prentice Hall, New Jersey, 2001.
- Bodnar, G.H., & W.H. Wood, Accounting information systems, 10th ed, Pearson, New Jersey, 2001, p. 30.

- Botten, N., Managerial Accounting – Business Strategy- Strategic level, CIMA’s Official Learning, CIMA Publishing – An imprint of Elsevier, 2008.
- Brock, H.R., & L.A. Herrington, Cost accounting: Principles and Applications, 6th ed, Glencoe/McGraw. Hill, 1999.
- Upchurch, A., Management accounting: Principles & Practice, FT Prentice Hall, Pearson Education Limited, 1998.
- Brewer, P.C, R.H. Garrison, E.W. Noreen, Introduction To Managerial Accounting, McGraw-Hill, 2007.
- Chapman, C.S., A.G. Hopwood, & M.D. Shields, Handbook of Management Accounting Research, ELSEVIER, Vol.3, 2009, p.1272
- Costanzo, C., “ABN AMRO Says Web Will Anchor Its Expansion” American Banker, www.abnamro.com/profile, 1999.
- Cooper, R. & R.S. Kaplan, The Design of Cost Management systems: Text, Cases, and Readings, Harvard Business Review, Prentice- Hall international, Inc., New Jersey, 1991, pp. 3-4.
- Chadwick. L., Management Accounting, Rout Ledge, London & New York, 1993.
- Drury, C., Cost & Management Accounting, 6th ed, Thomson, Australia, 2006.
- Folk, J.M, R.H. Garrison, E.W. Noreen, Introduction to Managerial Accounting, McGraw-Hill/Irwin, New York, 2002.
- Glad, E., H. Becker, Activity-Based Costing and Management, John Wiley & Sons, 1996.
- Gayle, L.R., Cost Accounting: Using a cost management approach, 6th edition, Irwin McGraw- Hill, New York, 1996.

- Hansen, D.R., Management Accounting, PWS-KENT Publishing Company, Boston, 1990.
- Horngren, C. T., Datar, S. M. and Foster G., Cost Accounting: A Managerial Emphasis, 10th ed, Pearson Prentice Hall, New Jersey, 2000.
- Horngren, C.T., G. Suddem & W. O. Stratton, Introduction to Management Accounting, 14th ed, Pearson Prentice Hall, New York, 2005.
- Horngren, C.T., G.L. Suddem, W.O. Stratton, D. Burgstahler,& J. Schatzburg, Introduction To Management Accounting, 14th ed, Pearson Custom Publishing & Pearson Prentice Hall, New York, 2008.
- Horngren, C. T., Datar, S. M. & Foster G., Cost Accounting: A Managerial Emphasis, 11th ed, Prentice Hall, New York, 2003.
- Jones, K. H, M.L. Werner, K.P. Terrel, & R.L. Terrel, Introduction To Management Accounting: A User Perspective, Prentice Hall, New Jersey, 2000.
- Jackson, S., R. Sawyers, G. Jenkins, Managerial Accounting: A focus on Decision Making, Thomson- South- Western, New York, 2006
- Johnson, H. T., & R. S. Kaplan, Relevance lost: The rise and fall of management accounting, Boston: Harvard Business School Press, 1987.
- Nigam, B.M.L., & I.C. Jain, Cost Accounting: An Introduction, Prentice Hall of India, New Delhi, 2001.
- Oowler, L.W.J.& J.L. Brown, Cost accounting and costing methods, 14th ed, Macdonald & Evans,1978
- Shim, J.K., & J.G. Siegel, Schaum's Outline of Theory & Problems of managerial accounting, McGraw-Hill, 2nd edition, 1999
- Taylor, A.H. & H. Shearing, Financial and Cost Accounting for Management: The Fundamentals of modern cost accounting techniques, 4th ed, McDonald and Evans LTD, London, 1965

- Weygand, J.J., D. E. Kieso, P.D. Kimmel, Managerial Accounting: Tools for business Decision Making, 3rd ed, John Willy & Sons, New York, 2005.
- Warren, C., J. Reeve, P. Fees, Managerial Accounting, 8th ed, Thomson South-Western, 2005, p.133
- Webster, W. H., Accounting for Managers, McGraw-Hill, New York , 2004

3.2 Theses & Dissertations

- AL-Nieel, A.H., Assessment Of The Effectiveness And Efficiency Of Modern Cost Accounting Methods In The Petroleum Production Companies In The Sudan, PhD, Dissertation in cost & management accounting ,SUST, Khartoum, 2011.
- Abusalama, F.A., Barriers to Adopting Activity Based Costing Systems (ABC): An Empirical Investigation Using Cluster Analysis, Dublin Institute of Technology, PhD, Thesis in accounting, 2008.
- Krumwiede, K.R, An Empirical Examination Of Factors Affecting The Adoption And Infusion Of Activity-Based Costing, Ph.D., The University of Tennessee, UMI company, 1996.
- Lado, J.W.J, The Adoption& Implementation Of Activity-Based Costing Techniques In Sudanese Sugar Industry, PhD, Thesis in Accounting, University of Juba, Khartoum, 2010.
- Nancy, M.M.A, Organizational and Environmental Determinants of Costing Systems and Its Impact on Corporate Performance: An Empirical study, Cairo University, Faculty Of Commerce, MSc, Thesis in accounting, 2011.

- Sanford, R.A., The Impact Of Activity-Based Costing On Organizational Performance, Nova Southeastern University, PhD, Dissertation in business Administration, ProQuest LLC, 2009.

3.3 Periodical

- Al-Omiri, M., A Survey Study of The Organizational and Behavioural Factors Influencing The Adoption and Success of ABC In KSA Companies, Cost Management, Boston: 2011, Vol. 25, No. 2, pp. 38-48.

- Ayvaz, E & D. Pehlivanl, The Use of Time Driven Activity Based Costing and Analytic Hierarchy Process Method in the Balanced Scorecard Implementation, International Journal of Business and Management & Published by Canadian Center of Science and Education, Vol. 6, No. 3, 2011.

- Al-Basteri, H. and S. Ramadan: A survey of Activity-based costing practices in Bahraini manufacturing firms, JKAU: Ecom & Adm, Vol.11, 1998, pp.17-29.

- Al-Omiri, M, & C. Drury, Organizational and Behavioural Factors Influencing The Adoption And Success Of ABC In UK, Cost Management, Vol. 21, No. 6, 2007, pp. 38-48.

- Akyol, D. E., G. Tuncel, & G. Bayhan, A comparative analysis of activity-based costing and traditional costing, World Academy of Science, Engineering and Technology, Vol. 3, 2005.

- Al-kadash, H. & M. Feridum, The Impact of Strategic Initiatives in Management Accounting on Corporate Financial Performance: Evidence from Amman Stock Exchange, Managing Global transitions, Vol. 4, No.4, 2006, pp. 299-312.

- Askarany, D., M. Smith, & H. Yazdifar, Technological Innovations, Activity Based Costing And Satisfaction, Journal of Accounting – Business & Management, Vol. 14, 2007, pp.53-63
- Buys, P., K. Green, Strategic Costing Techniques: Activity-based Budgeting, Accountancy SA, Accounting & Tax Periodicals, 2007, pp. 38-40.
- Banker R.D., I.R. Bardhan & T.Y. Chen, The role of manufacturing Practices in mediating the impact of activity-based costing on plant Performance, Accounting, Organizations & Society, Vol. 33, 2008, pp.1–19.
- Bacidore, J.M., J.A. Boquist, T. T. Milbourn, and A.V. Thakor, the Search for the Best Financial Performance Measure, Financial Analysts Journal, 1997
- Bjørnenak, T., Diffusion and Accounting: the Case of ABC in Norway, Management Accounting Research, and Academic Press limited, Vol.8, No.1, 1997, pp.3-17.
- Baird, K.M., G.L. Harrison, & R.C. Reeve, Adoption of Activity Management Practices: A Note on the Extent of Adoption and the Influence of Organizational And Cultural Factors, Management Accounting Research, Vol.15, No.4, 2004, pp. 383-399.
- Balakrishnan, R., E. Labro, & K. Sivaramakrishnan, Product Costs as Decision Aids: An Analysis of Alternative Approaches (Part 1), Accounting Horizons, American Accounting Association, Vol. 26, No. 1, 2012, pp. 1–20
- Byrne, S., E. Stower, P. Torry, Is ABC Adoption a Success in Australia?, Journal of Applied Management Accounting Research, Clayton North, 2009, Vol. 7, No. 1, pp.15-37.
- Buys, P., K. Green, Strategic Costing Techniques: Activity-based Budgeting, Accountancy SA, Accounting & Tax Periodicals, 2007, p.38-40.

- Balakrishnan, R., E. Labro, & K. Sivaramakrishnan, Product Costs as Decision Aids: An Analysis of Alternative Approaches (Part 1), *Accounting Horizons*, American Accounting Association, Vol. 26, No. 1, 2012, pp. 1–20
- Cagwin, D., & Bouwman, M.J., The association between activity-based costing and improvement in financial performance, *Management Accounting Research*, Vol.13, No. 1, 2002, pp. 1-39.
- Cohen, S., G. Venieris, E. Kaimenaki, ABC: adopters, supporters, deniers and unawares, *Managerial Auditing Journal*, Vol. 20, No. 9, 2005, pp.981 – 1000.
- Cinquini, L., P. Collini, A. Marelli, A. Tenucci, An Exploration of The Factors Affecting The Diffusion of Advanced Costing Techniques: A Comparative Analysis of Two Surveys (1996-2005), The 31st Annual Congress of the European Accounting Association Campus of the Erasmus University, Rotterdam (NL) April, 23rd to 25th, 2008, pp.1-17.
- Cooper, R., R. Slagmulder, Activity-based budgeting: Part 1, *Strategic Finance*, Vol. 82, No. 3, 2000, ABI/INFORM Global, pp. 84-85.
- Cooper, R., R. S. Kaplan, Activity-Based Systems: Measuring the Costs of Resource Usage, *Accounting Horizons*, Vol. 6, No. 3, Sarasota: 1992, p.1-12.
- Cooper, R., & Kaplan, R., How cost accounting distorts product costs, *Management Accounting*, Vol. 69, 1988a, pp. 20–27.
- Cooper, R., Kaplan, R. S., Lawrence, S.M., E. Morrissey, R.M., Oehm, From ABC to ABM, *Management Accounting*, Vol. 74, No. 4, 1992, ABI/INFORM Global, pp. 54- 57.
- Cooper, R., R. Slagmulder, Activity-based budgeting-part 2, *Strategic Finance*, Vol. 82, No. 4, 2000, ABI/INFORM Global, pp. 26- 28.
- Cooper, R., R. Slagmulder, Activity-based budgeting-part 1, *Strategic Finance*, Vol. 82, No. 3, 2000, ABI/INFORM Global, pp. 85- 86.

- Coulter, D., G. McGrath, A. Wall, Time-Driven Activity-Based Costing, Accountancy, Ireland, Vol. 43, No. 5, 2011, ABI/INFORM Global, p.12- 15.
- Dhu, R., T.W. lin, W.Y. Wang, & G.C.H. Hung, The Design And Implementation Of Activity Based Costing (ABC): A Case Study Of A Textile Company, International Journal Of Accounting And InformationManagement, www.Emeraldinsght.Com/18347649.Htm, Vol.17, No.1, 2009, pp. 27-52.
- Dimitropoulos, P., Activity -based costing in Sport organizations: Theoretical Background & Future Prospects, XOPHIA (Sport Management International Journal (SMIJ))-CHOREGIA (Scientific Fourm in Sport Management), Vol.3, No.2, 2007, pp.17-25.
- Dalci, I., V. Tanis, & L. Kosan, Customer profitability analysis with time-driven activity-based costing: a case study in a hotel, International Journal of Contemporary Hospitality Management, Vol. 22, No. 5, Emerald Group Publishing Limited, www.emeraldinsight.com/0959-6119.htm, 2010.
- El temsahi, A., & D. Fadaly, Investigation of the in-firm contingent factors to the adoption of recent management accounting practices, Accounting, Management & insurance Review, No. 12, Cairo University Press, 2009, pp.53-96.
- Everaert, P, G. Cleuren, S. Hoozée, Using Time-Driven ABC to Identify Operational Improvements: A Case Study In A university Restaurant, Cost Management, Vol. 26, No. 2, 2012, ABI/INFORM Global, pp. 41- 48.
- Granof .M. H., D.E. Platt and I.Vaysman, Using Activity-Based Costing to Manage More Effectively, The PricewaterhouseCoopers Endowment for the Business of Government, G r a n t R e p o r t, 2000, pp.1-31.

- Gupta, M., K. Galloway, Activity-based costing/management and its implications for operations management, *Technovation*, Vol. 23, 2003 pp.131–138
- Innes, J., F. Mitchell, & D. Sinclair, Activity-based costing in the U.K.'s largest companies: a comparison of 1994 and 1999 survey results, *Management Accounting Research*, <http://www.idealibrary.com>, Vol. 11, No.3, 2000, pp. 349-362
- Innes, J., & Mitchell, F., A survey of activity-based costing in the U.K. 's largest companies, *Management Accounting Research*, Vol. 6, 1995, pp. 137–153
- Innes, J., & F. Mitchell, *Activity Based Costing, A Review with Case Studies*, CIMA, 1990.
- Ittner, C. D., W. N. Lanen, & D. F. Larcker, The Association Between Activity-Based Costing and Manufacturing Performance, *Journal of Accounting Research*, University of Chicago on behalf of Institute of Professional Accounting, Vol.40, 2002, pp.711-726.
- Kennedy, T. and J. Affleck-Graves: The Impact of Activity-Based Costing Techniques on Firm Performance, *Journal of Management Accounting Research*, Vol.13, 2001, pp.19-45.
- King, A. M., The Current Status of Activity-Based Costing: An Interview with Robin Cooper & Robert S. Kaplan, *Management Accounting*, Vol. 73, No. 3, 1991.
- Krumwiede, K.R., & W. G. Jordan, Fewer Companies Believe ABC is Necessary, *New Survey Findings, Cost Management Update*, No.83, 1998, pp.1-3.
- Kaplan, R. S. & S.R. Anderson, *Time-Driven Activity-Based Costing*, 2004, pp.1-18.

- Kaplan, R. S. & Steven R., Anderson, The Speed-Reading Organization, Business Finance, www.searchfinance.com, 2007, pp. 39- 42.
- Kaplan, R.S., The Four-Stage Model of Cost Systems Design, Management Accounting, Vol. 71, No.8, 1990, pp. 22-26.
- Kaplan, R. S. & S. R. Anderson, The Speed-Reading Organization, business finance, www.searchfinance.com, 2007, pp. 39-42.
- Lawson, R.A., The Use Of Activity-Based Costing In the healthcare Industry: 1994 vs. 2004, Research in Healthcare financial management (RHF.M. Ltd), Vol. 1o, No. 1, pp. 77-94.
- Liu, L.Y.J.L. & F. Pan, The Implementation Of Activity-Based Costing In China: An Innovation Action Research Approach, The British Accounting Review, www.sciencedirect.com, Vol. 39, No.3, 2007, pp. 249-264.
- Liu, L.Y J, J. J. Robinson; J. Martin, An application of activity-based budgeting: A UK experience, Cost Management, Vol.17, No. 5, 2003, ABI/INFORM Global, pp. 30- 36.
- Lin, Z.J., and Yu, Z., Responsibility Cost Control System in China: A Case of Management Accounting Application”, Management Accounting Research, Vol. 13, No. 4, 2002, pp. 447-467.
- Malcolm, S., Managing your ABC system, Management Accounting, 1994, Vol. 75, No. 10, pp. 46- 47.
- Majid, J. A., & M. Sulaiman,, Implementation of activity-based costing in Malaysia: A case study of two companies, Asian Review of Accounting, 2008, Vol. 16, No.1, pp.39-55.
- Maelah, R., & D.N. Ibrahim, Factors Influencing Activity-Based Costing (ABC) Adoption in Manufacturing Industry, Investment Management and Financial Innovations, Vol. 4, No.2, 2007, pp.113-148.

- Myers, J. K , Traditional versus Activity-based Product Costing Methods: A Field Study In A Defense Electronics Manufacturing Company , Proceedings Of ASBBS, Vol. 16 No. 1, ASBBS Annual Conference: Las Vegas , 2009.
- Ning, Y., The Development of Costing Systems: A Historical Perspective, Journal of Modern Accounting and Auditing, ISSN1548-6583, USA, 2005, Vol.1, No.2, pp. 16-29.
- Narong, D.K., Activity-based Costing and Management: Total Quality Management Solution to Quality Cost Shortcomings of The Traditional Cost Accounting Systems, MSc of Accounting, California State University, 2008.
- Popesko, B., Activity-Based Costing Application Methodology For Manufacturing Industries, E+M Ekonomie a Management , ABI/INFORM Global, No. 1, 2010, pp.103-114.
- Rasiah, D., Why Activity Based Costing (ABC) is Still Tagging Behind The Traditional Costing In Malaysia?, Journal of Applied Finance & Banking, Vol.1, No.1, 2011, pp.83-106
- Ralph, B.F., Activity-based costing and the theory of constraints: Using time horizons to resolve two alternative concepts of product cost, Journal of Applied Business Research, 1998, Vol.14, No.1, pp. 83-89.
- Sartorius, K., C. Eitzen, & P. Kamala, The design and implementation of Activity Based Costing (ABC): a South African survey, Meditari Accountancy Research, Vol. 15, No.2, 2007, pp. 1-21.
- Shevasuthisilp, S., & K. Punsathitwong, Analysis of ABC in the after Press Services Industry, Proceedings of the International Multi Conferences of Engineers and Computer Scientists, 2009, pp. 18-20.
- SAP AG, White Paper - Business Intelligence – Aiming for the Strategic Costing System, <http://www.sap.com/contactsap>, 2009.

- Turney, P.B.B., Activity-based management, Management Accounting, Vol. 73, No.7, 1992a.
- Tucel, G., D.E. akyol, G. M. bayhan, U. koler, Application of Activity-Based Costing in a Manufacturing Company: Comparison with Traditional Costing, Computer science CCS,<http://www.springerlink.com/content/978-3-540-26044-8/>,2005, pp. 1-1
- UYAR, A., Cost and Management Accounting Practices: A Survey of Manufacturing Companies, Eurasian Journal of Business and Economics 2010, Vol.3, No.6, pp. 113-125.
- Wijewardena, H., A. D. Zoysa, a Comparative Analysis of Management Accounting Practices in Australia and Japan: An Empirical Investigation, the International Journal of Accounting, Vol. 34, No.1, 1999, pp. 49-70.
- Wegmann, G., The Activity-Based Costing Method: Development and Applications, The IUP Journal of Accounting Research, Vol. VIII, No. 1, 2009, pp. 7- 23.
- www.investopedia.com/terms/f/financialperformance.asp
www.businessdictionary.com/definition/financialperformance.html#ixzz2RjJs8rrC
- Zaman, M., The impact of Activity-Based costing on firm' performance: The Australian Experience, International Review of Business Research Papers, Vol. 5, No. 4, 2009, pp.200-208.

INTERVIEW QUESTIONS

Please provide answers to all following questions:

Section One: Profile of interviewees

Please indicate the following information:

1. Work Position.....
2. Academic Qualifications.....
3. Professional Qualifications.....
4. Experience Years.....

Section Two: Company Characteristics

5. No. of employees work in your company.....
6. No. of cost/management accountants work in your company
7. No. of products does company provide.....
8. The percentage of overhead cost to total costs.....
9. The type of industry in which your company operates.....

Section Three: General Information about Company' costing systems

10. Does your company's have a department for costing system?
11. Does your company's costing system incorporated in financial accounting system or separated?
12. What types of cost/management accounting systems being used by your company?

Job Costing	
Process Costing	
Absorption Costing	
Variable Costing	
Standard Costing	

Cost-Volume-Profit analysis (CVP)	9
Budgeting	9
Target Costing (TC)	
Total Quality Management (TQM)	
Activity-Based Costing (ABC)/ Management (ABM)	
Balanced Scorecard (BSC)	
Just in Time (JIT)	
Theory of Constrains (TOC)	
Other tools/ techniques (please specify)	

13. What are main purposes for using costing systems in your company?

Cost reduction	
Cost control	
Preparing financial statements (stock valuation)	
Performance measurement	
Cost planning	
Budget	
Variance analysis	
Product profitability analysis	
Customer profitability analysis	
Making decisions such as: <ul style="list-style-type: none"> • Pricing • Make or buy • Producing new products • Product redesign • Adding and dropping products, product line or department 	

• Introducing new market	
Any other purposes (please specify)	

Section Four: Status of adoption of activity based costing system and reasons for adoption

14.What is the current status of activity based costing adoption in your company?

a. The company has not adopted or implemented ABC system	
b. The company adopted (not implemented) ABC system and then rejected	
c. The company has currently implemented ABC system	
d. The company has begun or plans to adopt and implement ABC system	
e. The company plans to adopt and implement ABC system in the near future	

15.What are main reasons does your company adopt or intend to adopt ABC system in the future?

The existing costing system was not reliable and useful information for managerial decision.	
The existing costing system did not provide information to determine the cost of various activities performed in the company easily.	
The changing manufacturing environment and cost structure created the need to improve and update the existing costing systems to support managerial	
Our competitors were using ABC	
Pressure from government or other regulatory authorities	
ABC system improves product cost information which give the company competitive advantage.	
Others (please specify)	

**Section Five: Factors influence the adoption of activity based costing
and difficulties and problems associated with activity based costing**

16. What does your company use cost information?

a. Product costs information must be highly reliable for competition purposes	
b. Operating costs data is extremely important in cost reduction efforts	
c. Product costs are very important for the purpose of cost control	
d. Cost information is the most important factor when making decisions such as Pricing , Make or buy, Producing new products, Product redesign, Adding and dropping products, product line or department, Introducing new market	
Other (please specify)	

17. What are aspects of the manufacturing process of your company?

a. Product lines are more quite different	
b. Most products are different in product volumes or lot sizes	
c. Most products require similar resources to be manufactured, designed, and distributed	
d. The costs of support departments (e.g., engineering, purchasing, marketing) are about the same for each product line)	

18. To what extent does your company face competition?

a. The level of competition for your products has significantly increased over the past 10 years	
b. Price competition within this industry is extremely intense	
c. The level of competition in the market for the major products of your products is extremely intense.	

19. What are main difficulties and problems associated with ABC adoption or reasons for non adoption of ABC system in your company? (Tick as appropriate)

High costs (including cost of IT) of ABC implementation	
Complexity nature of ABC system with regard to determining activity cost pools and suitable cost drivers	
Insufficient support from top management	
No special cost accounting department	
Lack of adequate resources to effectively implement ABC (training, ABC skills or experts....etc.)	
No consultants and guidance center to develop costing systems in your company	
Lack of ABC knowledge by most of the accounting & employees staff skills in designing and operating ABC system	
Increased workload of cost/ management accountants	
Lack of training in advanced costing system by company	
Satisfaction with current costing system	
Lack of acceptance by managers	
Resistance to change by the management/ employees	
Pricing decision based on other economic factors (supply, demand, competition) than cost	
Our competitors are not introducing ABC	
The company does not operate in a very competitive environment , so an ABC system is not required	
Other difficulties (Please specify)	