



عمادة البحث العلمي
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The Role of Budgetary Software On Petroleum Refining Cost Reduction Field Study: Khartoum Refinery Co .Ltd

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المستخلص :

تتمثل مشكلة هذه الدراسة في ان تطبيق أنظمة المحاسبة الإدارية خصوصا أنظمة الموازنات في مجال تكرير النفط في السودان ودورها في تخفيض تكلفة التكرير، لذا فإن أهداف هذه الورقة هي زيادة دور أنظمة الموازنات إلى أقصى ما يمكن في شركة مصفاة الخرطوم المحدودة لخفض تكلفة تكرير النفط واعطاء شركة مصفاة الخرطوم المحدودة بعض الخطوات لتطبيق أنظمة الموازنات والتأكيد المعرفي لتداعيات هذه النظم في خفض التكلفة. وقد اتبع الباحث في هذه الدراسة المنهج التاريخي في ترتيب الدراسات السابقة والمنهج الإستنتاجي لاستنباط الحقائق والمنهج الوصفي للبيانات التي تم تحليلها باستخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية. و كانت نتائج الدراسة هي أن الأنظمة الإلكترونية المستخدمة في شركة مصفاة الخرطوم تساهم في خفض التكلفة في جميع مراحل الإنتاج و حتى في العمليات الإدارية والمالية ، وإن متابعة المخزون عن طريق الحاسوب وذلك بتحديد نقاط إعادة الطلب ساعد في المحافظة علي موارد الشركة. وأخيراً توصي هذه الورقة شركة مصفاة الخرطوم بأن يكون لديها لجنة مؤهلة لاختيار الأنظمة الإلكترونية وحتى عند ترقية النظم القديمة لتبرير تكلفة الترخيص والتشغيل بمقارنتها بالعائد وحجم الاستفادة من استخدام هذه النظم.

ABSTRACT:

The study problem examined the implementation of management accounting systems especially budgetary software systems in petroleum refineries sector in Sudan and its role in reducing the cost of refining. Thus, the objectives of this paper are to maximize the role of budgetary software systems in Khartoum Refinery Company Ltd in order to reduce the petroleum refining cost; besides offering Khartoum Refinery Company Ltd some guidelines in implementing budgetary software systems, and emphasizing the knowledge of budgetary control software and its impacts on cost reduction. The researcher adopted the historical approach in order to arrange the previous studies; and the deductive approach for deducting the facts; and the descriptive approach for the analysis of data by using the statistical package for social sciences program (SPSS). The study results indicated that the electronic systems that used by Khartoum Refinery Company contributes in cost reduction in each production stages even in management and financial operations. Furthermore, following up inventories by computers through determining repetitive demand points assists in efficient utilization of Khartoum Refinery resources. Finally this paper recommended that Khartoum Refinery should have a qualified committee for choosing the electronic software systems; and even when updating the old ones to justify the installation and licenses cost in order to compare it with the yields and the benefits of using these software systems.

KEY WORDS: Optimization – Enterprise Resource Program - Information Technology in Management Accounting.

INTRODUCTION

While management accounting taking steps on development, the information technology (IT) had taken a dramatic and rapid change. Also, petroleum refineries got great chances in improving its technology in order to enhance its performance economically and technically. However, the problem of this study arise when connecting petroleum refineries processing technology with management accounting software especially budgeting, where there is a gap of knowledge in Sudan, which may be due to the fact that commissioning of petroleum refineries is still a new topic. Consequently, this problem can be summarized in the following questions:

1- What is the role of the software in optimizing the petroleum refining cost?

2-To what extent can budgetary software be helpful in petroleum refining cost reduction?

Therefore, the importance of this paper is to fill in the knowledge gap regarding connecting budgetary system in oil refinery with modern technology; besides providing some ideas, which can be applied in Khartoum Refinery. Accordingly, the objectives of this study are:

1-Maximization of the role of modern software in Khartoum Refinery in order to reduce the refining cost.

2-Enhancing the participation of planning budgets in optimizing the refining cost.

Previous Studies:

The researcher reviewed several studies in the field, which include the following:

Elgabr (1997): the study indicated that the responsibility of cost reduction is the responsibility of each person in the organization, whether he is manager or a member of a staff. Also, the idea of cost reduction should be realized from all members of the staff.

Faleeh (1999): the study indicated that the total cost concept may reduce the cost by taking the general view of the product life cycle as a whole, where it coincides with the researcher main ideas mentioned in this study.

Yousuf (2002): the study indicated that the modern cost methods; besides the organizational culture of the employees; and change in their attitudes towards the firm can be helpful in reducing the cost incurred by the organization.

Dirar (2005): the study demonstrated that the existence of the costing department in the company is very important to achieve its goals, since the formation of the integrated costing system will provide information to help the administration to take rational decisions. Moreover, the cost system acts as a supervisory tool to the performance and cost factor, in addition an accurate costing system may help in performance revolution.

Mahmoud (2005): the study indicated the importance of computerized cost accounting system for the administration of industrial complexes. It is undoubtedly that computerized system is far better than the manual one with regard to its use in these industries. In addition, computerization of the cost accounting system is accompanied by the computerization of all other systems related to the costing system at the complex.

Fareed (2007): the study found out that planning, controlling, and evaluation of budgets, and adoption of accurate system of performance will improve the productive efficiency of the organization's personnel.

Ahmed (2010): the study indicated that planning budgets is suitable for all projects whether small or large and helps the administration in the utilization of resources efficiently, and reducing their losses.

Hammad (2011): the study main findings include: the budgetary planning, which is put down by the company may not be considered as a strategic planning; because it contains

many items that demonstrate unrealistic objectives, thus leading to poor performance and low productivity by the company's employees.

Ayman (2011): the study indicated that the petroleum production sector did not apply a modern cost accounting technique. Consequently, despite the fact that these previous studies covered several topics that related to the petroleum sector such as budgeting as a control tool, the concept of cost reduction and costing systems. However, none of these studies covered directly the concept of budgetary software in refineries, which had been reviewed by the researcher in this paper.

Literature Review:

Budgets & budgeting:

A budget is defined as "a plan expressed in quantitative, usually monetary, terms which covers a specific period of time" (Susumu, 1993). According to period and activities a budget can be divided into operation budget and capital budget, where an operating budget is the annual budget of an activity stated in terms of Budget Classification Code, functional/sub functional categories and cost accounts. It contains estimates of the total value of resources required for the performance of the operation including reimbursable work or services for others. It also includes estimates of workload in terms of total work units identified by cost accounts." (James, 2012). Alternatively, capital budgeting procedure is based on firm's perception of planning for financial increment due to a successful market performance, customers' satisfaction and retention, capacity to launch new products or possibility of improving old ones. The capital investment decision is usually an irreversible decision. Once an organization has committed funds to a project, it must see to the end of the project or else, it might lose all the money initially committed." (Elumilade, 2006). Capital budget is so vital because the major planning decisions will already have been made as a part of the long term planning process. However, the annual budgeting process leads to the refinement of those plans, since managers must produce detailed plans for the implementation of long range plan, where without the annual budgeting process, the pressures of day to day operating problems may tempt managers not to plan for future operations (Drury, 2001). That is the general view for budgeting. Nevertheless, in petroleum refineries the case is a little bit different, since the information technology (IT) era interpose in every things and every where including the management accounting area. Application of IT in management accounting has been popular recently, as organizations found the importance of management accounting to their benefit which helps to access the organizations' potentials. The management accounting professional bodies including Chartered Institute of Management Accountants (CIMA) and The Association of Chartered Certified Accountants (ACCA) has stressed on IT and emphasize that IT has got the future to provide information to management for better decision making. (Krishna, 2012). Thus, these changes in information technology have its effects on management accounting, especially the following parts.

The Benefits of IT Applications in Management Accounting:

The data and information provided by the management accounting system is accurate and valid. The system is able to gather data and information from various resources or departments using data mining technology. The data mining technology uses single database repository that stores various information needed by the accounting system. As such, the budget or cost information provided to the management for decision making is deemed as accurate and real time. During traditional accounting, the response for management accounting information may take weeks but with application of IT, the information is ready immediately. The technology is capable with a large number of data to perform multi-tasking to achieve the desired result. Current technologies also allow users to choose the design of the reports wanted with a few mouse clicks. Management accounting systems are also capable of

producing 3D charts for presentations. Most of the systems are user-friendly and easy to use. The management accounting system is able to provide various solutions for decision makers. IT can be designed to give recommendations and remedies to the management. ¹⁵ (Ibid, p: 9). Furthermore, manufacturing companies use management accounting techniques to assess their operations. These include budgeting, variance analysis and breakeven analysis. These methods help organizations to plan, direct and control operating costs and to achieve profitability. It is recognized that management accounting practices are important to the success of the organization. (Philmore, 2011).

Enterprise resource planning (ERP) system is a business management system that comprises integrated sets of comprehensive software, which can be used, when successfully implemented, to manage and integrate all the business functions within an organization. These sets usually include a set of mature business applications and tools for financial and cost accounting, sales and distribution, materials management, human resource, production planning and computer integrated manufacturing, supply chain, and customer information. (Abdullah, 2011). ERP systems offer tremendous opportunities to more consistently provide information to organizations in a standardized, centralized, and cost efficient manner. Many industry reports enlarge the advantages of ERP and its multiple benefits for those firms that database accessible by all modules, eliminating the need for multiple entries of the same data. Customers and suppliers with network security clearance are allowed to access certain types of information by way of an external communication interface (Injazz, 2008).

Management Requirements for ERP implementation

The ERP implementation has a life cycle beginning with a company's decision to go for it up to final stage. The articles belonging to a sub-theme of 'Focused Stage' address a particular stage of the ERP implementation life cycle. They are the ERP system selection process, the customization of the ERP system, the configuration of the ERP system, the determination of a hosting service. Finally, a group of articles are interested in any differences between cultures and nations in implementing ERP systems' (Young, 2007). Hence, the researcher thinks that ERP requires huge efforts both from management and staff. This includes well planning for each department, job and project. Best installation for the modules and full package of the programs.

However, the implementation for ERP or any other budgetary software may not get its maximum benefits unless it takes in the consideration the following planning issues:

1-Production and Operations:

Planning and scheduling takes care of better short and long term plans for the entire area of operations starting with crude selection/shipment procedures, processing details / plans and dispatch of products. Linear programming (LP) models are normally used to optimize such operations and play an important role in improving their profitability. (Young, 2007). Furthermore, operational innovation includes the familiarities with entirely brand new ways of developing new products, providing customer service, or performing any tasks along the supply-chain that adds value to the enterprise. Therefore, the objective of applying operational innovation along the supply-chain is to discover new ways of working by examining and optimizing core business links (Christopher, 2007).

2-Miscellaneous Costs:

Salaries and wages should be linked to profit performance. Personnel can achieve superior results in energy efficiency, maintenance, operating expenses measures of profitability. A team of competent and committed employees forms the major strength's of the refinery in a competitive environment. Subsidiary information could be provided on those items which are in line with the budget. Many control reports also segregate controllable and non-controllable costs and revenues, that is, the costs and revenues over which managers can exercise control

are highlighted separately in the reports. A number of accounting packages have the facility to record actual and budget details against each account code for each budget centre. (Janet, 2005). However, managers can go through the changes between the actual and the budget details, then tailor effective ways for shorten the gaps later. Strategies for inventory reduction, such as Just in Time, address the fact that carrying inventory at all stages raw materials, work-in-process, finished goods increases costs. However, inventory builds up occur for a reason. (Gupta, 2003). This reason for optimizing material cost, in addition to have arecord for the issues of spare parts for more preventive maintenance (inspections, component replacements) of production systems require shutdown of the units involved. If these units are used continuously, as is the case in process industry, shutdown can be very costly and management will try to minimize their duration and frequency.²⁵ (Rommert, 1996). Thus, inventory management is a critical task; should get more benefits from this software.

The Field Study

MATERIALS and METHODS

The study adopted the historical, deductive, and analytical methods using both primary and secondary sources. The primary sources include collection of information through a questionnaire and personal interviews; while secondary sources include references, books, periodicals, published thesis, dissertations, reports and internal scientific conferences. Then the data were analyzed by using SPSS.

The community and the Study Sample

The community of the study is Khartoum Refinery Company Ltd; the sample is the staff whose job nature is related to budgeting process. The population of the sample is 70 staff, where seven of them on medical/ annual leave. The researcher has distributed 62 questionnaires and collected all of them.

The Limitations of the study:

Research limitations: Khartoum Refinery Company .Ltd, where the research had been conducted in year 2012.

The Study Tool:

The study used the questionnaire as a tool, which had been tested in order to ensure its objectivity, validity and reliability as follows:

OBJECTIVITY:

- 1- The researcher reviewed certain previous studies referring to the method adopted in their analysis, which help him in writing his questionnaire.
- 2- The researcher has submitted the questionnaire to his supervisor for the assessment.
- 3- After the supervisor assessment the researcher has submitted the questionnaire to a number of referees form both Sudan University of Science and Technology and Elnilin University taking their comments into consideration.
- 4- Then he distributed some questionnaires to testify their ability to get the required data.

Validity and Reliability:

The researcher has made the following statistical analysis to verify the validity and reliability of the questionnaire:

Table (1): the distribution of frequency and percentage of the age groups of study sample.

Age	Frequency	Percent(%)
30 years &Less	12	19.4
31-40	38	61.3
41-50	5	8.1
more than50	7	11.3
Total	62	100.0

Source: Prepared by the researcher from the Questionnaires Data 2012.

The result presented by table (1) indicated that 19.4% of age groups are less than 30 years; 61.3% of age groups their age range between (31-40 years); 8.1% of age groups between (41-50 years); and finally 11.3% of age groups their age is more than 50 years. Consequently, this result indicated that the age of the majority of the study sample range between (31-40 years) indicating the maturity of the study sample and hence increasing the reliability of the study.

Table (2): the distribution of frequency and percentage of the Qualification of study sample

Qualification	Frequency	Percent (%)
Diploma	13	21.0
BSC	36	58.1
H.D	4	6.5
MSC	9	14.5
Total	62	100.0

Source: Prepared by the researcher from the Questionnaires Data 2012.

The results showed by table (2) illustrate the Qualification of the study sample pointing that 21% from the study sample have got an undergraduate Diploma; while 58.1% have got a Bachelor degree; 6.5% have got a postgraduate Diploma; and 14.5% from the study sample hold a Master degree. Accordingly, more than 79 % are holding a BSc or postgraduate certificates; therefore it increases the reliability of this study.

Table (3): the distribution of frequency and percentage of the Specialization of study sample.

Specialization:	Frequency	Percent(%)
Accounting	7	11.3
Business Administration	7	11.3
IT	10	16.1
Engineering	35	56.5
other	3	4.8
Total	62	100.0

Source: Prepared by the researcher from the Questionnaires Data 2012.

Table (3) illustrated the Specialization of study sample, which showed that 11.3% from study sample specialized in accounting; 11.3% specialized in Business administration; 16.1% specialized in IT; 56.5% specialized in Engineering; and finally 4.8% have other specialization. Accordingly, taking into consideration that the number of those who specialized in IT and Accounting studied a number of business topics, thus increasing the number of those with business background to 38.7%; and if we add to this number the percentage of those who are specialized in engineering and other specialization; but they are strongly involved in budgetary work due to their work nature indicating more reliability of the study sample.

Table (4): the distribution of frequency and the percentage of the Posts occupied by study sample

Position	Frequency	Percent(%)
Staff	39	62.9
Supervisor	8	12.9
Section Head	10	16.1
Manager	4	6.5
Division Manager	1	1.6
Total	62	100.0

Source: Prepared by the researcher from the Questionnaires Data 2012

Table (4) showed that 62.9% of study sample are ordinary staff with no administrative responsibilities; 12.9% are supervisors; 16.1% are section heads; 6.4% are managers; and finally 1.6% are division managers. Thus, the study sample indicated that the majority of employees are ordinary staff with no administrative responsibilities; while the rate of the decision makers (supervisors, section heads, manager and division manager), represents 37 %, which is a considerable rate; and if we take into consideration that the Khartoum Refinery uses technique of bottom up budgeting, which raises the rate of contribution of the staff in budget process; thus increasing the reliability of the study.

Table (5): the distribution of frequency and percentage of the years of Experience of study sample

Experience (years)	Frequency	Percent(%)
5years & Less	15	24.2
6-10	15	24.2
11-15	19	30.6
16-20	5	8.1
21-25	6	9.7
more than25	2	3.2
Total	62	100.0

Source: Prepared by the researcher from the Questionnaires Data 2012.

Table (5) illustrated the distribution of frequency and percentage of the years of Experience of study sample, and showed that 24.2% from study sample have got five or less years of

experience; 24.2% have got (6-10) years of experience; 30.6% have got (11-15) years of experience; 8.1% have got (16-20) years of experience; 9.7% have got (21-25 years) of experience; and 3.2% have got more than 25 years of experience. Consequently, indicating that the majority of the study sample years of Experience ranged from (11-15 years), this means that about 75.8 % of the sample have got more than five years of experience, indicating that their knowledge about the work nature is so high, then their opinion about the statements is considerable. Also, this supports the reliability of this study.

5-Discussion and Results:

Table (6): the frequency and percentage answers of study sample about the research questions.

Statement	Strongly agree	Agree	Fair	disagree	Strongly disagree
1. Budgeting software helps in production cost reduction because it reduces the time and effort in budget preparation.	30 48.4%	25 40.3%	4 6.5%	2 6.5%	1 1.6%
2. Using budget software assists in immediate performance reports, and in controlling the company expenses.	25 40.3%	27 43.5%	5 8.1%	5 8.1%	-
3. Limitation of each budget items by the software assists in budget controlling.	25 40.3%	16 25.8%	12 19.4%	8 12.9%	1 1.6%
4. Limitation of each employee's authorities in charge of the software helps the finance department realizing the budget controlling.	22 35.5%	31 50%	5 8.1%	4 6.5%	-
5. Sending actual performance reports Immediately by the software for the concerned department has an important role in controlling budget implementation.	30 48.4%	24 38.7%	6 7.9%	2 3.2%	-
6. Accurate designing for the performance reports by computer graphic and charts programs helps top management in correcting procedures.	27 43.5%	25 40.3%	9 14.5%	1 1.6%	-
7. Computerizing inventories by limiting the maximum and minimum reorder level assists in saving company's resources, and in controlling the budget.	31 50%	22 35.5%	7 11.3%	2 3.2%	-
8. Preparing of managerial and cost accounting forms for the employee's attendance and connect them by the human resources and costing software, reduces the wasting times, and the labor budget.	31 50%	21 33.9%	5 8.1%	2 3.2%	3 4.8%

Source: Prepared by the researcher from the Questionnaires Data 2012.

The results showed by table 6 indicated that the majority of respondents are strongly agreed to the positive role played by budgetary software in optimizing the petroleum refining cost, and hence in reducing its cost.

Table 7: the mean, standard deviation, Chi-Square, degree of freedom, probability value of the research questions.

Statements	Means	STD	Ch ²	D.F	P.value
1. Budgeting software helps in production cost reduction because it reduces the time and effort in budget preparation.	4.161	0.891	28.58	3	0.00
2. Using budget software assists in immediate performance reports, and in controlling the company expenses.	4.306	0.861	62.67	4	0.00
3. Limitation of each budget items by the software assists in budget controlling.	3.903	1.127	40.58	3	0.00
4. Limitation of each employee's authorities in charge of the software helps the finance department realizing the budget controlling.	4.145	0.827	33.87	3	0.00
5. Sending actual performance reports immediately by the software for the concerned department has an important role in controlling budget implementation.	4.323	0.785	35.80	3	0.00
6. An accurate design for the performance reports by computer graphic and charts programs helps top management in correcting procedures.	4.258	0.767	30.64	3	0.00
7. Computerizing inventories by limiting the maximum and minimum reorder level assists in saving company's resources, and in controlling the budget.	4.323	0.805	34.64	3	0.00
8. Preparing of managerial and cost accounting forms for the employees attendance, working and departing hours and connecting these forms by the human resources and costing departments reduces the wasting times, and reducing the labor budget.	4.210	1.058	54.12	4	0.00

Source: Prepared by the researcher from the Questionnaires Data 2012

Table 7 illustrated the means, standard deviation, Chi-Square, degree of freedom, and probability value of answers of the study sample about the research questions. We realized that all means are greater than the mean hypothesis and equal (3), that indicates all means of items go to positive direction; also it shows that the standard deviation range between (1.127-0.767) where the difference between the highest and lower standard deviation is less than one, which indicates the similarity and homogeneity of answers of the study sample about the questions and pointed that the probability value of all questions is less than 0.05 indicating that all answers of study sample go to positive direction and agreed to the positive role played by budgetary software in optimizing the petroleum refining cost, and hence in reducing its cost.

Study Findings:

The study results indicated that the updated restricted software used by Khartoum Refinery contributes in cost reduction in each production stages including the management and financial transactions. Moreover, computerizing inventories by limiting the maximum and minimum reorder level assists in saving Khartoum Refinery resources. Also, sending actual performance reports immediately by the software for the concerned department in Khartoum Refinery has an important role in controlling budget implementation.

Recommendations

The study recommends conducting software training courses for the administrators and the users at Khartoum Refinery. Furthermore, Khartoum Refinery should have a qualified committee in order to decide on matters relating to purchasing of new software or even updating the existing ones to justify the installation and licenses cost in order to compare it with the yields and the benefits of using this software.

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