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A Research on Total Cost of Ownership and Firm Profitability

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Abstract
Business managements take into account only the price of product or services for purchasing decisions. Considering only the purchasing price might pose a risk with respect to the business budget and it could decrease firm's profitability performance. At this point, total cost of ownership (TCO) affects purchasing costs, supplier selection and firm profitability. TCO is a cost accounting tool and philosophy which aims at understanding the true cost of buying a particular good or service from a particular supplier. TCO helps selection of the optimal supplier with respect to all the direct and indirect costs in the life of the product/service. The risk of budget failure decreases and the sources of the company are used more effectively. Additionally, the profit of the company increases. The aim of this paper is to examine how TCO helps companies make true decisions on purchasing activities in terms of cost accounting and how firm profitability performance is affected.
Keywords: Total Cost of Ownership, Purchasing, Cost Accounting, Supplier Selection, Profitability

1. Introduction

In today's business world characterized by intense global competition, cost management is an important tool for management accounting. External purchases of products and services generally account for more than 50 percent of total cost in the corporate budget. Significant cost savings can be realized by effectively managing total costs and determining optimal purchasing. For almost every organization, the accounting system is an important source of information for both the external party concerned (financial accounting) and the internal decision makers (management accounting). The aim of management accounting is to generate information that helps decision makers structure the organization effectively and efficiently, in view of the organization's objectives. A well-developed cost accounting system provides managers with a better knowledge of their own business and ensures that the organization's objectives are pursued at every level. The importance, in a highly competitive environment, of possessing a thorough knowledge of one's own activities and processes, together with the latest developments in information technology, have prompted many organizations to improve existing management accounting information systems. New concepts such as activity based costing and management, target costing, life cycle costing, benchmarking, management charts, total cost of ownership and operating indicators are examples of this.

Generally, cost management tools focus on the fulfillment of the production and marketing functions whereas purchasing activities are not considered in terms of the management function. Therefore, I should analyze purchasing process in the context of firm's profitability performance. "Because, purchasing transactions from supplier are the largest expenditure for most firms (Nelson et al., 2001) the ability of effectively manage and reduce costs can result in valuable, non-transferable, and non-imitable human and knowledge resources that can provide a significant competitive advantage for companies.

2. The Concept of Total Cost of Ownership

As a management accounting-oriented purchasing approach, TCO is most often used for the supplier selection decisions (Degraeve et al., 2000). The approach requires the quantification of qualitative factors into monetary terms, which enables supplier comparison not only on quantitative factors like price and delivery time but also on elements that are more difficult to measure, like quality. For example, a company that wishes to incorporate price and quality into a TCO model may wish to add to the purchase price the cost of rework on items that are below quality standards, or a cost supplement based on the actual percentage of quality defects times the cost for purchasing a replacement item. This approach incorporates all the relevant costs in the model (Hurkens et al., 2006). The phrase 'total cost of ownership' was originally developed by Bill Kirwin, director in Gartner Inc., to refer to all the costs associated with the use of computer hardware and software including the administrative costs, license costs, deployment and configuration, hardware and software updates, training and development, maintenance, technical support and any other costs associated with acquiring, deploying, operating, maintaining and upgrading computer systems in organizations. TCO is also called total cost (Cavinato, 1991), life cycle cost of product (Shields and Young, 1992), life cycle costing (Dunk, 2004; Tysseland, 2008), cost based supplier selection (Monckza and Trecha, 1988) and all cost (Lembke, 1998). These concepts all suggest that managers adopt a long-term perspective, not a short-term, initial-price perspective, for the accurate valuation of buying situations (Ferrin and Plank, 2002).

TCO is a purchasing tool and philosophy that aims at understanding the relevant cost of buying a particular good

or service from a particular supplier (Ellram and Siferd, 1998). As a management accounting tool, TCO helps organizations gain a long-term, systems-oriented understanding of the true cost of doing business such that profit and efficiency increase. The TCO may relate to the cost of working with a supplier, a make-or-buy (outsourcing) decision, or a production process choice decision (Ellram, 1994). In addition, TCO is an important tool for supporting strategic cost management since it requires the buying firm to asses and measure the costs that are most relevant or significant in the acquisition, possession, use and subsequent disposition of a good, service or process choice (Ferrin and Plank, 2002). TCO is a tool that can serve to analyze these indirect costs, and is argued to be one of the important instruments in supporting a more strategic focus on purchasing management (Wouters et al. 2005).

Purchasing decisions quite often affect a large part of a company's total costs, not only in terms of direct acquisition costs but also regarding indirect costs in the areas of inventory management, quality assurance, administration and payment, among others (Hurkens et al. 2006). Data provided by TCO analysis is very important for cost accounting and company decisions. The following are the reasons and benefits of using TCO:

- The TCO approach is logical and easy to understand,
- The approach brings the total cost of an item into perspective, so that an improved supplier selection decision can be made,
- The model can provide important data for analyzing, negotiating, and reducing the total cost of purchasing and thus profitability increases,
- It helps companies plan future supplier performance
- It concentrates resources on the "important few" purchases
- It helps companies forecast new item's performance based on historical data

However, there are some barriers to the implementation of TCO such as education and training, cultural issues that relate to general resistance to change, and the "not invented here" syndrome and resource issues, which lack readily accessible data to support efforts/lack of systems or intensive labor to develop and support.

2.1 Comparison of TCO with Other Cost Determination Models

To develop and understand total costs in purchasing decisions and supplier evaluation, various types of costing models are used such as life cycle costing (LCC) (Fernandez, 1990), zero based pricing or all in cost (Dobler et al., 2003), target costing (Castellano and Young, 2003), activity-based costing-ABC (Kallunki and Silvola, 2008). The first method is known as the activity-based costing (ABC) which was designed with the objective of providing managers with accurate activity-based cost information by using cost drivers to assign activity costs to products and services (Rajiv et al., 2008). Calculations could be based on activity-based costing (ABC), which explicitly uses the activities that drive costs to assign (overhead) costs to items.

Life cycle cost analysis is of increasing importance to firms as international competition intensifies and technological change continues. Paying attention to product life cycle costs is expected to enable organizations first, to assess better the effectiveness of planning by comparing actual with budgeted life cycle costs as well as the distribution of those costs (Clinton and Graves, 1999). This approach is congruent with TCO but is only a subset of TCO activity. TCO is applicable to virtually every type of purchase and includes the prepurchase costs associated with a particular supplier. The LCC include pre-action costs. But its scope is narrower than TCO. Zero-base pricing advocates understanding suppliers' total costs. In contrast to TCO, zero-base pricing focuses heavily on the supplier's pricing structure and cost of doing business.

Target costing is an important strategic management accounting topic. Competition now requires that firms deliver products and services that meet customer's demands for quality, functionality and price. To compete in this environment, an organization must become more flexible and responsive in meeting customer needs. Since price is determined by market conditions, a new system of profit planning and cost management is needed. Target costing, with its customer, design, and process focus is ideally suited to help meet this need (Castellano and Young, 2003). As it focuses on long-term cost management efforts, target costing is considered to be a strategic accounting management system (Chenhall et al., 1998; Ewert and Ernst, 1999; Guilding et al., 2000; Tani 1995). The firms choose the market price to reach the intended profit and costs are determined for optimal profit levels. After this stage firms resort to target costing.

2.2 Implementation of TCO

Ellram (1993) suggested a transaction-sequence cost component structure, involving pre-transaction cost components, transaction cost components, and post transaction cost components. This typology is more general and considers direct and indirect costs. Pre-transaction cost components include costs related to activities such as identifying a need and investigating a source. Transaction cost components include price, delivery, tariffs, inspection, etc. Post-transaction cost components include cost categories such as field quality problems and cost of repair parts. Tibben-Degraeve and Roodhooft (1999) provided a case study illustration of the application of total cost of ownership to supplier selection. They divided purchasing activities into three hierarchical levels: A firm performs supplier-level activities, ordering-level activities and unit-level activities. Using this activity

hierarchy, Degraeve and Roodhooft developed a mathematical programming optimization model for TCO minimization. In this research three level cost modeling is used (pre-transaction costs, transaction costs and post-transaction costs). For calculating TCO, the following function is used:

TCO=*f* {pre-transaction costs, transaction costs, post-transaction costs}

2.3 Methodology

The aim of this exploratory study was to build a spreadsheet-based tool for calculating the TCO for a computer company. The works of the company, the operations center of which is in Turkey, was identified to serve as a test case for the development of the model. The tool should support purchasing, supplier selection and firm profitability. Supplier selection in this case does not refer to the real "recruitment" of a supplier, but to the allocation of the total purchase spent among the three existing suppliers. After the calculation, the results will be demonstrated on alternative income statements. The research model is shown in Figure 1.

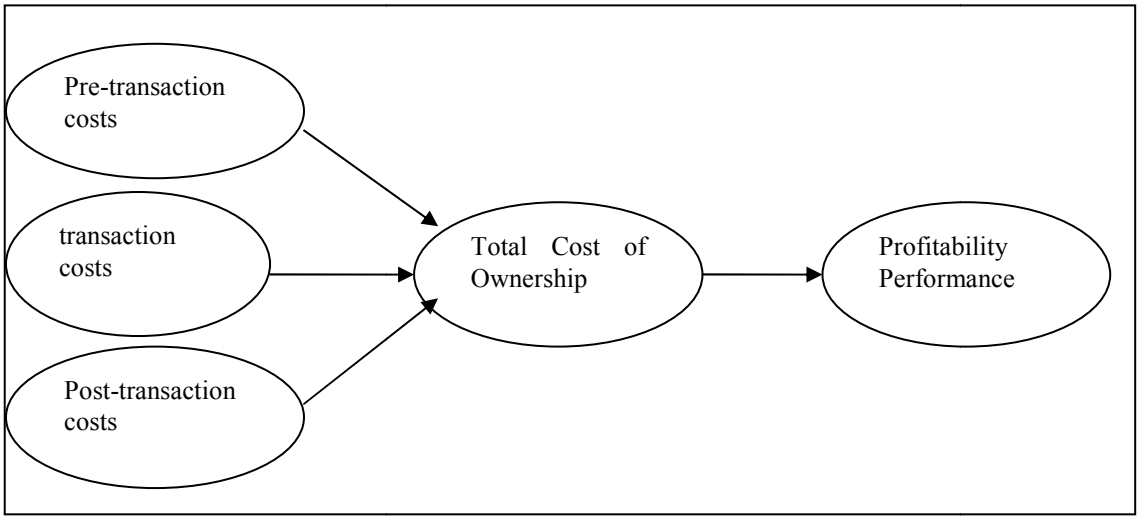

Figure 1. Research Model

2.4 Case Study

Company's management had planned to sell 15000 computers for the first year. There are alternative suppliers (A, B, C) for computer purchasing. Using TCO, we can select the true supplier. After selection, we can calculate profitability. (Sale price per computer $1000). The company has 1.000.000 shares.

D18 =SUM(D4:D17)

	A	B	C	D
1	**CALCULATING TCO**			
2	**Cost Component ($) Per Computer**	Supplier A	Supplier B	Supplier C
3	**Pre-Transaction Costs**			
4	Supplier Research Cost Per Computer	40	20	15
5	Negotions with Supplier Per Computer	20	30	10
6	Quality Research Cost Per Computer	15	15	10
7	**Transaction Costs**			
8	**Licence Costs Per Computer**	100	100	100
9	Purchasing Price Per Computer	500	540	560
10	Notary (Contract) Per Computer	5	5	5
11	Value Added Tax (18%) Per Computer	108	115,2	118,8
12	Transportation	40	20	10
13	Transaction Costs			
14	**Post-Transaction Costs**			
15	Consumable Material for 1 Year Per Computer	30	25	10
16	Technical Support Per Computer	10	5	5
17	Maintenance Per Computer	20	15	5
18	**TCO per Computer**	888	890,2	848,8
19	**Total Cost Of Ownership (15000 Numbers)**	13320000	13353000	12732000
20				

Figure 2. Scores of Calculating

According to figure 2, the supplier C is the suitable for company because of the post-transactions cost which presents best cost structure in the alternatives. The supplier C is going to decrease of unpredictable costs and risk for buyer. On the other hand supplier A and B have a intense risk for company's purchasing budget. And their offers occur a big deficit in the expected incomes from operating.

Table 1. Alternative Income Statements for Supplier A, B, C that Used TCO

X Company Income Statement	If we select supplier A	If we select supplier B	If we select supplier C
Gross Sales (15000 Numbers X 1000$)	$15.000.000	$15.000.000	$15.000.000
Cost of Sales	(13.320.000)	(13.353.000)	(12.732.000)
Profit of Sales	1.680.000	1.647.000	2.268.000
Other Incomes	500.000	500.000	500.000
Other Expenses	(400.000)	(400.000)	(400.000)
Before Tax Income	1.780.000	1.747.000	2.368.000
Income Tax 25%	(445.000)	(436.750)	(592.000)
Net Income	1.335.000	1.310.250	1.776.000
Earning Per Share	$1,33	$1,31	$1,77

Table 1 that demonstrates income forecasts regarding to alternatives, choosing supplier C the company acquire bigger profit advantage (approxmatiely 15,15% gross-profit). And acquiring big profit margins augment the company's rivalry against the rivals. This event also has a long term effect on company success that depend on financial performance.

Gross Profit Margin (A) = 1.680.000/15.000.000x100= 11,2 %
Gross Profit Margin (B) = 1.647.000/15.000.000x100= 10,98 %
Gross Profit Margin (C) = 2.268.000/15.000.000x100= 15,15 %
Net Profit Margin (A) = 1.335.000/15.000.000x100= 8,9 %
Net Profit Margin (B) = 1.310.250/15.000.000x100= 8,7 %
Net Profit Margin (C) = 1.776.000/15.000.000x100= 11,8 %

If the company considers only the transaction price or the purchasing price, the management must select supplier A ($500 per computer), but other cost components will be omitted. In this state, profit margin is not enough. Thus, supplier A cannot be accepted. Nevertheless, if we use TCO, the supplier must be C since total costs decrease. Consequently, gross profit margin, net profit margin and earning per share increase and contract is done with supplier C. Thus, TCO affects firm profitability performance positively and total costs are minimized.

3. Conclusion

Recent developments in cost accounting, combined with intensive computerization of the business environment, make it possible for organizations to collect a wealth of internal information. This study outlines how it is possible to use some of this information to achieve higher efficiency in the purchasing activities and with respect to the firm's profitability performance. This performance should be based on several criteria. Price, quality, reliability with respect to delivery terms, service, and geographical location are a number of important examples. A decision model was presented which, based on the philosophy of the total cost of ownership, attempts to minimize the total costs involved in external purchasing. There are many reasons to implement the TCO analysis of purchasing processes, but many barriers prevent the full implementation and use of TCO concepts in strategic cost management. By focusing on activities and associated cost drivers, purchasing can identify the goods and services that provide the firm with the lowest total cost of ownership. This approach enables substantial cost savings to be achieved and, at the same time, allows various purchasing policies to be compared with another.

This exploratory study makes a contribution to purchasing and cost accounting theory and practice in a number of ways. First, it shows the linkage between TCO and understanding total costs. Purchasing costs are highlighted as crucial elements of strategic total cost management. The principles advocated here can be used to better understand and evaluate any link among the total costs. Second, this exploratory study establishes a theoretical

framework for TCO analysis by linking it to transaction cost analysis in the cost accounting literature. Third, the TCO method is compared with other total cost determination methods. Fourth, the study suggests a generic model of TCO which can be applied more effectively in terms of the profitability of a firm. The paper shows that TCO represents an important means for the management accounting to add value to a firm and TCO can be a useful tool for uncovering the obvious as well as the hidden costs of conducting business with different suppliers. It is more than a tool. TCO is a philosophy that guides purchasing in the supplier selection decisions as well as in supplier evaluation and negotiations for minimum costs.

The fact that the spreadsheet has already been partially adopted and developed further proves its added value to firm profitability. The examples of these are shifting quality confirmation activities to the supplier and investigating the option of committing adverse buys with non-preferred suppliers instead of dealers. Additionally, the firms can now more thoroughly realize the enormous impact the differences in payment terms have on TCO. This particular finding has specific and immediate usefulness in negotiating. Occasionally, a supplier has lower costs of capital than the customer and thus may be more interested in extending payment term rather than giving price reductions. This paper has also demonstrated that in the case of an activity-based TCO model, it is crucial to develop an accurate, precise, and complete representation of the physical and administrative processes in the pre-transaction, transaction and post-transaction phases of the purchasing process. Based on the exploratory study, TCO represents a rich opportunity for purchasing that would contribute to the profitability success of a firm. TCO is used also as an important measure of operational effectiveness in the design and procurement of capital equipment.

The implications of this research for future research are many. First, TCO represents a proactive, positive way for purchasing to develop a better understanding of costs and a firm's profitability success. Based upon this improved understanding, purchasing can work to improve the firm's cost structure, focus supplier performance improvements in areas where the benefits will be the greatest, improve the overall profit that purchasing brings to the firm. Second, there are barriers to TCO implementation. These barriers, associated with the corporate culture/tradition, education and training and resources can complicate and frustrate the TCO development and implementation processes. Third, future researches are needed to develop an understanding of why some firms pursue TCO, while others do not. Further research that more specifically quantifies the benefits of TCO, such as cost reduction dollars or percent, might also be useful.

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