Value Chain Cost Tracing And Cost System Obsolescence: An Exploratory Study Of Small To Medium-Sized Companies

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Abstract

To succeed in today's competitive business environment, corporations need to undertake value chain analysis and select an optimal mix of value chain activities. Based on the data collected from 73 small- to medium-sized companies, this study provides evidence regarding current practices in value chain cost tracing and cost system obsolescence. The research findings indicate that companies do a better job of linking value chain costs to products/product lines than to customers/customer classes. Overall, however, the proportion of each value chain cost attributed to either cost object tends to be low. This indicates that firms' management may be rather slow in adopting new management tools. Furthermore, most companies are still using volume-based cost allocations, which suggests cost system obsolescence. Implications of this study and future research directions are also discussed

Introduction

In today's business environment, managers face global competition and increasing pressure for higher productivity. To answer these challenges, corporate America has made concerted effort to improve its operational efficiency during the past decade. Many management tools have been introduced and implemented to enhance corporate competitiveness. Of the tools available, Porter (1985, p.33) suggests that the "value chain" approach, which involves "disaggregating a firm's operations into strategically relevant activities in order to understand the behavior of costs and potential sources of dif-

ferentiation," can be one of the effective tools for optimizing use of resources. Many other authors have expanded upon Porter's framework to explain how value chain analysis can be an important managerial tool (e.g., Hergert and Morris, 1989; Partridge and Perren, 1994; Shank and Govindarajan, 1992, 1993; SMAC, 1996).

The value chain is the sequence of major business activities that add utility (usefulness) to the products or services provided by an organization to its customers. While one can define or group such activities at different levels of detail, the following represents a common approach to categorizing such activities¹:

Readers with Comments or questions are encouraged to contact the author via e-mail.

- **Overall Administration** -- Strategy formation, establishment of policies, coordinating, directing, and undertaking the legal, financial, human resource, and accounting functions.
- **Research and Development** -- The generation of, and experimentation with, ideas related to new products, services, or processes.
- **Design** of products, services, or processes -- The detailed planning and engineering of products, services, or processes.
- **Production** -- The coordination, acquisition and use of resources to produce products or deliver services.
- **Marketing** -- The process by which external customers (a) learn about and value the attributes of products or services and (b) purchase those products or services.
- **Distribution** -- The mechanism or process by which products or services are delivered to external customers.
- **Customer Service** -- The support activities provided to external customers after the sale.

How a firm undertakes these value chain activities can affect its profit in two ways (Gadiesh and Gilbert, 1998). First, the efficiency of these activities may impact the firm's cost structure. Second, the mix of value chain activities can affect customers' satisfaction with the product and/or services provided by the firm (Artto, 1994; Shields and Young, 1991; Susman, 1989). For example, more emphasis on upstream activities such as research and design could increase the cost at an early stage of the product. However, it may reduce the costs of downstream activities such as marketing. Brimson (1987, p. 5,14), for example, has observed that most decisions made during the design phase lock in 90% of costs while only five to ten percent of the costs can be controlled during manufacturing. Thus, an important part of managing value chain activities is to evaluate how different mixes (i.e., trading off across activities) affect total costs, revenues, and profit, instead of treating each ac-

tivity as an independent component. Determining the optimal mix of value chain activities requires sound knowledge of the costs of activities and how they are allocated to support different products and customers (Boer, 1996; Foster, 1996; Foster and Gupta, 1994; Foster, Gupta and Sjoblom, 1996; Innes and Mitchell, 1995).

Since most empirical cost management studies have been focused on major companies such as the Fortune 500 (e.g., Magretta, 1998), this study is particularly appealing because it sheds light on how smaller firms have taken advantage of this innovative new cost management tool. No doubt evidence from this study can also assist academicians and practitioners in understanding how value chain cost analyses are implementing in the small- to medium-sized firms which contribute more than half of this country's national economy.

To discern the current states of value chain analysis and to better understand how such analysis is implemented in a business, important background information is provided in the next section. Section III discusses the research design and data collection processes. Section IV presents the findings on how, and how well, the studied firms trace their value chain costs to products and customers. Finally, the discussion of research findings, the implications of this study, and the identification of possible future research directions are highlighted in Section V.

Background

Booth (1997) argued that value chain analysis provides a useful perspective into a company's competitive position. In this study, Booth pointed out that two benefits of the analysis are reaching better decisions on how to achieve product differentiation and creating cost leadership. By examining the value chain upstream and downstream, the management will be able to understand the strengths and weaknesses of their company's operation. Booth also specifically identified three areas in the value chain

analysis that demand further research: (1) the identification of value chain activities and the main cost categories; (2) the allocation of costs to the appropriate activities; and (3) the identification of cost drivers and linkages within the value chain. To expand on the Booth model, this study examines the value chain issues regarding the distribution of operating costs in each value chain activity/category, cost tracing by cost objects, and the relationships between value chain costs and degree of cost tracing. In addition, this study also explores the connection between value chain cost tracing and cost system obsolescence in the sampled firms.

Distribution of Operating Costs

Management needs to consider the firm's business strategy and operating environment and then determine how to effectively invest the firm's resources in various value chain activities (Gadiesh and Gilbert, 1998). For example, some firms may reap greater increases in value by investing proportionally more in product design, while others may gain a greater competitive edge by focusing on marketing (Carr and Tomkins, 1996; Cooper, 1996). To gain insight into this area, it is necessary to investigate how different types of firms distribute costs to each of these cost/activity categories.

To add value to products (or services), it is beneficial for manufacturing companies, such as a start-up biotechnology company, to invest more resources in upstream activities such as research and development and/or product design, which may enhance product differentiation. On the other hand, service-oriented companies (e.g., a local commercial bank) may find it useful to allocate more resources on downstream activities such as customer services. Consistent with Booth's framework, the first step in value chain analysis should focus on identifying value chain categories and the specific costs within them.

Cost Tracing by Cost Objects

To effectively control value chain costs, a firm's management must select a cost tracing approach and track operating costs by cost objects. This is especially important for companies seeking continuous improvement opportunities (Gagne and Discenza, 1993). According to Garison and Noreen (1997), cost objects can be products, product lines, customers, jobs, or organizational sub-units such as departments or divisions of a company. For the purpose of this study, two commonly used cost objects are selected: (1) products or product lines, and (2) customers or customer classes. Since limited research has been done to examine cost tracing along the value chain activities, this study explores, through a survey of managers, how these cost objects are used to trace the value chain cost in different industries.

Relationships between Value Chain Costs and Degree of Cost Tracing

For cost-effectiveness, it is important for a firm to design a cost system that can provide necessary information at the lowest possible cost. To this end, prior research suggests that the magnitude of the operating costs in each value chain activity should be considered explicitly when determining the degree of cost tracing (Steiner, 1990; Susman, 1992; Tanaka, 1989; Turney and Reeve, 1990; Yoshikawa et al., 1989). Two statistics are worth examining to answer this inquiry. A positive correlation between these two elements indicates a possible causal relationship between the magnitude of operating costs and the degree of cost tracing in the category. Furthermore, a significant correlation supports the notion that management may explicitly consider a cost-benefit relationship when designing a cost tracing system.

Value Chain Costing Tracing and Cost System Obsolescence

In addition to directly evaluating firms'

current practices, validating inferences with indirect evidence is also desirable. Since one of the major benefits of value chain analysis is to assist corporate managers in identifying and resolving problems, information regarding cost system obsolescence can help academicians and practitioners in deriving some conjectures as to why managers adopt or do not adopt value chain analysis in their daily operations. To investigate whether there is an association between level of value chain analysis and the symptoms of cost system obsolescence, the study uses the research framework developed by Cooper in his 1989 study and conducts a survey to gather information from corporate managers.

Research Design and Data Collection Process

This study utilizes a survey approach to examine managers' experiences in managing value chain activities. The research instrument, data collection procedures, and demographic background of the studied firms are described in this section.

Research Instrument

There are two sections in this survey. Questions pertaining to the nature of the firm and the annual sales of the responding companies comprise the first section. Additional questions, such as each respondent's current position and number of years of experience in that position, are also included in the section. The second section of the questionnaire makes inquiries about the firm's current practices related to adopting value chain cost analysis. As stated in the previous section, there are four focal points in the study. First, the respondent firms' cost distributions by value chain activity categories and the cost tracing approaches are examined. Then, the extent of which firms attributed to value chain activities cost to cost objects are studied. Third, the relationships between the magnitudes of their operating costs and the degrees of cost tracing for each category are investigated. Finally, the relationships between the degrees of value chain

analysis and the symptoms of cost obsolescence in the respondent firms are further explored.

Data Collection Processes

Questionnaires were sent to 357 firms with at least 25 employees listed in the 1996 *San Diego Business Journal*. All of these companies operate in the San Diego metropolitan area and are relatively small compared to Fortune 500 companies. After identifying the mailing addresses of the firms to be surveyed, the questionnaire was sent to the personal attention of the Chief Executive Officer (CEO) of each company, along with a formal letter explaining the purpose and nature of the study. The letter requested the CEO to direct the questionnaire to the person most knowledgeable about the firm's costing system. A self-addressed, postage-paid return envelope was enclosed with each questionnaire. Completed questionnaires were mailed directly back to the author. A total of 73 questionnaires were returned, which represents a 20.45 percent usable response rate that is in line with survey research of this type.²

Results

The findings are presented in the following order in this section. First, the study reports how the studied firms' annual operating costs are distributed among the seven value chain activities. Then, the examination focuses on the extent to which firms attribute each value chain cost to products/product lines, and the allocation bases used. Next, I discuss the findings on attributing costs to customers/customer classes, followed by the correlation analysis between percentage of operational costs and the degree of cost tracing in each category. Finally, the findings on the various symptoms of cost system obsolescence the studied firms have encountered in the past three years are explored. These results provide indirect inference that there is room for companies to improve their cost management practices.

Demographic Background

The 73 responding firms are from the manufacturing and service sectors, including accounting and legal services, construction and design, communications, financial services, health care, hospitality/travel, retail and software. The average annual sale of these companies is US\$115.63 million, ranging from \$1 million to \$2,000 million (with a standard deviation of \$273 million). The individuals who completed the survey held relatively high positions in their companies: 23 (31.5%) were chief financial officers; 32 (43.8%) were controllers; and the remaining 18 (24.7%) were at other high level positions. On average, they had been in their current positions for about seven years (with a standard deviation of 6.98 years); thus the respondents can reasonably be expected to have sufficient knowledge of their firms' current costing practices to provide informative answers.

Distribution of Costs among Value Chain Activities

Panel A of Table 1 shows that production accounts for the highest portion of annual operation costs (35.45%) for the entire sample. The average proportions of costs in the other value chain activities are overall administration (20.51%); research and development (14.09%); design (6.04%); marketing (8.35%); distribution (6.31%); and customer services (9.33%). Panels B and C provide cost distribution data for the service and manufacturing firms in the sample. These panels indicate some notable differences between the two sectors. For example, the costs of overall administration and customer services are proportionally higher for service firms than for manufacturing firms. On the other hand, the average cost for research and development for the manufacturing firms is substantially higher than that of the service firms. In addition, as one may expect, the results also support that the cost of marketing, distribution, and customer service for the service industry is considerably higher than for manufacturing companies.

Three points about these findings are worth noting. First, a wide range of cost distribution and a relatively high standard deviation within each value chain activity suggest that the studied firms face a range of different circumstances and/or have elected to emphasize different parts of the value chain. This observation supports the notion that a firm may decide to focus on different aspects of the value chain and use value chain analysis as a tool to gain a competitive advantage. Second, it appears that manufacturing firms, in general, invest more on upstream value chain activities while service firms provide more resources to downstream activities. Finally, the costs of all of the non-production activities are large enough to be worthy of close management and scrutiny.

Linking Value Chain Costs to Products/Product Lines

In this study, I also examine the percentage of each value chain cost being attributed to products/ product lines based on an explicit consideration of cause and effect relationships. If we consider "high level" cost tracing (61% or more), only production category is well traced by approximately half of the sample firms (49.6%). By combining none and missing value categories as another extreme, 63.0% and 60.3%, respectively, of the firms do not trace any of their overall administrative and distribution costs to products/product lines. Overall, one can conclude that the respondent firms either traced costs extensively or did not trace cost by value chain activities at all. Very few companies implemented value chain analysis, and ended up tracing their operating costs only to a "low level" (60% or less).

The results also show that, relative to service firms, the manufacturing companies attribute a higher percentage of each value chain cost to products/product lines. In sum, firms from the manufacturing sector more often than service firms traced costs by products/product lines in most value chain activity categories. In

TABLE 1
Distribution of Annual Operating Costs Across Value Chain Activities

Panel A: Combined Sample of 73 Firms

Value Chain Activity	Mean	Std. Dev.	Minimum	Maximum
Overall Administration	20.51 %	21.56 %	1.00 %	100.00 %
Research and Development	14.09 %	24.79 %	0.00 %	95.00 %
Design	6.04 %	12.19 %	0.00 %	80.00 %
Production	35.45 %	27.64 %	0.00 %	87.00 %
Marketing	8.35 %	7.58 %	0.00 %	30.00 %
Distribution	6.31 %	11.87 %	0.00 %	80.00 %
Customer Service	9.33 %	17.98 %	0.00 %	90.00 %

Panel B: Sample of 43 Service Firms

Value Chain Activity	Mean	Std. Dev.	Minimum	Maximum
Overall Administration	24.44 %	24.88 %	1.00 %	100.00 %
Research and Development	2.10 %	3.46 %	0.00 %	17.00 %
Design	3.50 %	4.74 %	0.00 %	20.00 %
Production	36.24 %	27.17 %	0.00 %	84.00 %
Marketing	10.26 %	8.10 %	0.00 %	30.00 %
Distribution	8.12 %	14.19 %	0.00 %	80.00 %
Customer Service	14.12 %	22.11 %	0.00 %	90.00 %

Panel C: Sample of 30 Manufacturing Firms

Value Chain Activity	Mean	Std. Dev.	Minimum	Maximum
Overall Administration	15.15 %	14.73 %	4.00 %	70.00 %
Research and Development	30.47 %	31.40 %	1.00 %	95.00 %
Design	9.50 %	17.49 %	0.00 %	80.00 %
Production	34.38 %	28.72 %	0.00 %	87.00 %
Marketing	5.75 %	6.02 %	0.00 %	23.00 %
Distribution	3.83 %	7.14 %	0.00 %	25.00 %
Customer Service	2.78 %	5.45 %	0.00 %	26.00 %

contrast, however, only seven percent of service firms traced their research and development cost extensively (81% or more) to product/product lines compared to approximately 60% of manufacturing firms that traced this cost to the same extent. Similar observations can be made for product design and production categories as well. Undoubtedly, part of these differences between firms in the service and manufacturing sectors may reflect the different issues and challenges of cost tracing faced by different industries. They may also reflect, in part, difference in the degree of attention management pay to

cost system re-engineering.

The respondents further provide the primary bases for allocating value chain costs to products/product lines. Because the firms that traced either none or very little of each value chain cost generally did not provide relevant answers to this inquiry, the usable samples were relatively small. A small sample size may limit the reliability of the research findings on this question. Nevertheless, the results do shed light on the firms' current practices. Based on all 73 companies are presented, direct tracing based on

actual usage is quite popular among companies. Indeed, for production, marketing, distribution and customer service, actual usage is the single most-often-used cost allocation basis. However, a variety of other allocation bases, which in sum exceed direct tracing in frequency, are also common. A striking characteristic of these allocation bases is that all of them are proportional to output volume (output-based, volume-oriented). Thus, despite the tremendous attention that has been paid to activity-based costing (ABC) that promotes various non-output-based cost drivers, this results strongly suggests that small- to medium-sized firms still have not reaped the full benefits of this recent advance in cost management.

Linking Value Chain Costs to Customers/Customer Classes

To further investigate the percentage of each value chain cost being attributed to customers/customer classes, the number of firms in the "none" category shows that most respondent firms do not engage in such cost tracing. For all value chain activities, the average percentages of cost being traced to customers/customer classes in all seven categories are relatively low in both sectors. With the exception of production, less than 40% of the service companies traced their operational costs by cost object. Similar results are also found for the manufacturing sector. Comparing to the earlier results in this study, the proportion of operating costs being traced to customers/customer classes is much lower than that to products/product lines.

Relative to tracing costs to products/product lines, only a subset of the sample provided information on cost tracing based on customers/customer classes in their cost management systems. The result indicates that direct tracing of actual usage is the single most-often-used approach for production, marketing, distribution and customer service costs. This result suggests that the sample firms tend to use similar approaches to trace operating costs to both prod-

ucts and customers. Overall, the predominance of volume-based allocation, together with the low portions of value chain costs attributed to customers/customer classes, again suggests that the small- to medium-sized firms in the sample might well benefit from adopting the recent advances in cost system management.

Relationships between Value Chain Costs and Cost Tracing

Since it is costly to establish a cost system, it is pertinent for a firm's management to explicitly consider both cost and benefit in designing a cost tracing system. In other words, if a particular value chain cost is large, a firm may find it beneficial to engage in an elaborate cost tracing exercise, but not if the cost is small. Thus if firms are approaching their costing system rationally, one would expect a positive correlation to exist between the percentage of operating cost in each category and the degree of cost tracing for that category. However, this question cannot be answered directly based on the preceding statistics. Since only two common cost objects were identified in this study, it would be interesting to explore the relationship between value chain cost and the degree of cost tracing (both direction and magnitude) for products/product lines and customers/customer classes.

To explore the existence of the aforementioned relationships, Spearman's correlation were computed between the percentage of operating cost in each value chain category and the degree that cost traced to each cost object (i.e., by products or by customers). Table 2 presents the overall results, which are quite consistent with the expectation. Correlations are positive in all cases except overall administration. Panel A shows that there is a significant correlation between the two elements in research and development, and design (respectively $r = 0.694$, 0.575 ; $p < 0.001$, 0.001 .) by products/product lines. In addition, there is a less significant correlation between the percentage of cost and the degree of cost tracing in distribution, customer

TABLE 2
The Correlation (p-value) Between Percentage of Operating Cost and Degree of Cost Tracing by Value Chain Categories
 (Non-parametric Spearman's Correlation for all 73 companies)

Panel A: By Products or Product Lines

Value Chain Activity	Overall Admin.	Research & Development	Design	Production	Marketing	Distribution	Customer Service
1 Overall							
2 Administration	-.113 (.359)						
3 Research and Development		.694 (.001)***					
4 Design			.575 (.001)***				
5 Production				.218 (.089)*			
6 Marketing					.121 (.358)		
7 Distribution						.322 (.024)**	
Customer Service							.256 (.052)*

Panel B: By Customers or Customer Classes

Value Chain Activity	Overall Admin.	Research & Development	Design	Production	Marketing	Distribution	Customer Service
1 Overall							
2 Administration	-.237 (.130)						
3 Research and Development		.651 (.001)***					
4 Design			.541 (.001)***				
5 Production				.234 (.127)			
6 Marketing					.211 (.191)		
7 Distribution						.507 (.002)***	
Customer Service							.186 (.269)

*: significant at a 10 % level.

**: significant at a 5 % level.

***: significant at a 1 % level.

services, and production (respectively, $r = 0.322, 0.256, 0.218$; $p < 0.024, 0.052, 0.089$). These results support that there is a significant correspondence between magnitude of operating costs and degree of cost tracing of the respondent firms by products or product lines³, particularly in upstream value chain activities.

Using the same analysis, the level of correspondence between the two elements in each value chain category according to customers or customer classes was also studied. Panel B of Table 2 illustrates all statistical results. From this panel, one can see significant correlations between magnitude of costs and degrees of cost tracing for research and development, design, and distribution. They are all significant at the 1% level (respectively, $r = 0.651, 0.541, 0.507$, $p < 0.001, 0.001, 0.002$). Since the respondent firms are in service industry, it seems logical to expect a strong correlation between the two in marketing, and customer service activities by customers/customer classes. However, the results from data analysis do not indicate such a relationship exists for the aforementioned categories.

Value Chain Cost Tracing and Cost System Obsolescence

By evaluating the studied firms' current practices, it is still somewhat puzzling why some companies trace their operating costs using the value chain approach while others do not. Although direct evidence of an answer to this question is not attainable, two conjectures can be made in this study. One is that there is a cost consideration associated with adopting this practice. Since it can be costly to implement value chain analysis, the price tag may be too high for some smaller companies. The other is that the firm's management may not perceive the potential benefits of adopting the value chain analysis because they may not have experienced any symptoms of cost system obsolescence. On the other hand, management of firms that experienced such symptoms may be more willing to

adopt a new cost management technique and less reluctant to go to the trouble and expense of making changes.

To validate the first conjecture, I examine whether, for the respondent companies, there is a correlation between firm size and degree of cost tracing. To this end, the firm's total annual sales revenue is used to proxy the firm size. The statistical result of Spearman's correlation test reveals that there is a strong correlation between firm size and degree of cost tracing by the value chain activity ($r = 0.279$, $p < 0.022$). This result indicates that firm size may be one of the determining factors (or indirectly, a cost-benefit consideration) in adopting value chain analysis.

To validate the conjecture about cost symptoms; managers were asked how often in the past three years that the line managers in his/her firm had encountered any of the 11 symptoms of cost system obsolescence suggested by Cooper (1989).⁴ Because the results are very similar for the service and manufacturing sectors, only their combined findings are reported in Table 3.

Table 3 shows that not all the symptoms of cost system obsolescence are encountered with equal frequency. Still, several symptoms do occur often enough to cause concern. For example, 43 firms (58.9%) of the companies responding to this survey indicated that they have encountered difficulties in explaining some of their products' profit margins. Sixty-three firms (86.3%) managers indicated that they need to ask their accounting departments to conduct special studies. In addition, over 50% of companies that responded to our study reported at least one of the following cost symptoms in their companies: (1) at least periodically, they find competitors' prices appear unrealistically low; (2) their own price increases are quite readily accepted by customers; (3) their suppliers' quotes are lower than expected; and/or (4) they have difficulty explaining why they win or lose bids. While

TABLE 3
Frequencies of Line Managers Encountering Symptoms of Cost System Obsolescence in Past Three Years: Number (Percent) of Firms Out of 73 Reporting Each Symptom

Symptom of Cost System Obsolescence	Frequency of Encounter					Weighted Frequency
	"Never"	"Occasionally"	"Periodically"	"Frequently"	"Constantly"	
Wanting to drop products or components that the company's official cost accounting system identifies as being profitable	32 (43.8%)	15 (20.5%)	2 (2.7%)	0 (0.0%)	0 (0.0%)	17 (23.3%)
Finding it hard to explain some products' profit margins	14 (19.2%)	17 (23.3%)	15 (20.5%)	11 (15.1%)	0 (0.0%)	43 (58.9%)
Finding hard-to-make products showing big profits even though they are not premium priced	17 (23.3%)	9 (12.3%)	6 (8.2%)	0 (0.0%)	0 (0.0%)	15 (20.5%)
Making use of a private cost accounting system separate from the company's official one	39 (53.4%)	4 (5.5%)	3 (4.1%)	3 (4.1%)	1 (1.4%)	11 (15.1%)
Needing to ask the accounting department to conduct special studies	4 (5.5%)	16 (21.9%)	28 (38.4%)	16 (21.9%)	3 (4.1%)	63 (86.3%)
Finding that you have a high-margin niche all to yourself	22 (30.1%)	16 (21.9%)	2 (2.7%)	4 (5.5%)	2 (2.7%)	24 (32.9%)
Finding competitors' prices to appear unrealistically low	6 (8.2%)	25 (34.2%)	16 (21.9%)	6 (8.2%)	4 (5.5%)	51 (69.9%)
Finding price increases to be quite readily accepted by customers	16 (21.9%)	25 (34.2%)	10 (13.7%)	5 (6.8%)	2 (2.7%)	42 (57.5%)
Finding suppliers' quotes to be lower than expected	13 (17.8%)	35 (47.9%)	5 (6.8%)	0 (0.0%)	0 (0.0%)	40 (54.8%)
Finding products' reported costs to change when the company complies with new financial accounting regulations	21 (28.8%)	14 (19.2%)	6 (8.2%)	1 (1.4%)	1 (1.4%)	22 (30.1%)
Finding it difficult to explain why you win or lose bids	10 (13.7%)	22 (30.1%)	13 (17.8%)	4 (5.5%)	0 (0.0%)	39 (53.4%)

each phenomenon has many possible causes, the confluence of multiple symptoms does lend credence to our inference that the sampled firms' costing systems are neither meeting management needs nor reaching the potential derivable from recent advances in cost system thinking and design.

Summary and Conclusions

Competitive advantage depends fundamentally on how a firm generates revenues and

controls costs (i.e., improves its profitability) while enhancing the customer satisfaction. During the past two decades, many cost management techniques have been introduced to corporate America. One of these tools is value chain activity analysis. Successfully implementing this management tool undoubtedly would strengthen a company's competitive advantages. Information on cost distribution, cost allocation bases, and relationship of value chain costs and degree of cost tracing is essential to manage value chain activities successfully.

Survey findings from 73 small- to medium-sized firms show that, on average, value chain costs in all seven categories are large enough to warrant attention. As a whole, more firms link a higher proportion of their costs to products/product lines than to customers/customer classes. However, high proportions of each value chain cost remain unattributed to either cost object, and volume-based allocation bases predominate. This result suggests that the studied firms may not take full advantage of value chain cost analysis. Similar to Shim and Sudit (1995), the results of this study may also reflect that management act slowly in adopting new management tools. Furthermore, the results from the study strongly support a relationship between percentage of operating costs and the degree of cost tracing in firms' existing cost systems, particularly for those upstream activities such as research and development and design. In addition, the respondent firms also have encountered, to different degrees, various symptoms of cost system obsolescence.

The sampled firms in this study include both manufacturing and service companies, and there is no a priori reason to expect their operations, cost structures, and cost systems to be radically different from each other. Thus, the research findings of this study provide a reasonable basis for inferring how small- to medium-sized firms, in general, can improve their cost management systems. To improve a firm's cost management system, four initiatives, in particular, seem worthy of consideration. First, attention must be given to the entire set of value chain costs, and especially to the increasing amounts of costs being directed at activities that are upstream (e.g., R&D, design) and downstream (e.g., customer services) to production. Second, firms' management has to come to realize the importance and benefits in increasing cost tracing to value chain activities by products/product lines and customers/customer classes, especially the latter. Third, the scope of cost allocation bases need to be expanded to include cost drivers that are not volume-based, such as those related

to batch, product, and facility-level activities. Fourth, a concerted effort should be directed at leveraging the first three initiatives to improve the selection of value chain activities and their management. By playing an active and leading role in implementing these advances, management accountants will increase the value of their contributions while ensuring their inclusion on the firms' strategic management team (Kaplan 1995).

Suggestions for Future Research

It is beneficial for researchers interested in value chain analysis to first derive an ideal cost structure of the studied firms. One could then examine the relationship between degree of variances from ideal cost structure and the firm's profitability. Such examination can also expand in a cross-border setting.

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Endnotes

1. Six of these value chain activities are categorized based on the literature of Horngren, Foster and Datar (1997, p.3) and SMAC (1996, p.4). The first activity, namely "overall administration," is added based on Porter's (1985) discussion.
2. Whenever responses are obtained from only part of the sample, there is the potential for the respondents to be non-representative of the sample as a whole. Survey studies often assess the severity of this problem by comparing the answers in early versus late responses. I did not conduct such a comparison because all of the responses were received within a three-week window. I surmise that a response

bias in the data would tend to paint a more favorable picture of current practices, as the firms that responded are likely to be those that are very interested in their costing system or firms that are looking for better systems. If such a bias exists, our findings still suggest there is much room for improving practices.

3. Pearson correlation analyses provide results similar to those of Spearman.
4. The respondents were instructed to check a "not applicable" box if they had no knowledge of particular situations.

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