

Product Costing Practices in the North American Hardwood Component Industry

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ABSTRACT

Companies, when bidding for jobs, need to be able to price products competitively while also assuring that the necessary profitability can be achieved. These goals, competitive pricing and profitability, cannot be reliably achieved unless industry participants possess a full understanding of their company's cost structure. Competitors blame companies without detailed knowledge of their company's cost structure for submitting bids that are priced unreasonably low, thereby making it harder to achieve the necessary profitability. To better understand the product costing practices of North American hardwood dimension and component manufacturers, a mail survey was conducted. A total of 495 companies were contacted and 74 valid responses were obtained for a response rate of 16%. Most respondents gather primarily financial information from their current costing system. Respondents use the financial information to create financial reports, tax reports, inventory valuation, and to calculate the cost of their product. A majority of respondents (74%) reported using a traditional cost accounting system, 13% an activity-based cost accounting system, 4% a lean accounting system, and 9% of respondents indicated using a proprietary system.

1. INTRODUCTION

The North American hardwood dimension and components industry consists of approximately 500 known wood establishments in the United States and Canada. These establishments are mostly small, family owned businesses generating a total of \$4 billion in value of shipments in 2009 (Lawser 2010). Like other segments of the U.S. wood products industry, the hardwood dimension and component industry faces intensive foreign competition, high customer expectations, and ever-changing market conditions (Buehlmann and Schuler 2009, Schuler and Buehlmann 2003, Kline et al. 1992).

Participants of the North American hardwood dimension and components industry, when bidding for jobs, need to be able to calculate competitive prices while at the same time assuring that the necessary profitability for the firm's survival can be achieved. Both goals, competitive pricing and profitability, can only be reliably achieved when industry participants possess a reasonable understanding of a company's costs. However, anecdotal evidence suggests that not all participants of the North American hardwood dimension and component industry fully understand their company's cost structure. Competitors blame companies without detailed knowledge of its cost structure for submitting bids that are priced unreasonably low, thereby making it harder for all industry participants to achieve the profitability necessary for survival.

Given the importance of cost information for a company, the type and quality of costing systems being used are recurring topics in the accounting literature. In 1993, Cheatham and Cheatham observed that changes over the last three decades in both the manufacturing environment and in cost accounting systems for manufacturing had been dramatic (Cheatham and Cheatham 1993). In response, new accounting techniques have been developed to accommodate highly automated, computerized manufacturing systems (Myers 2010) and to incorporate changes in the competitive environment (Burns and Vaivio 2001). Still, numerous researchers have criticized the widely used traditional cost accounting practices since such systems do not reflect today's product diversity and operational complexity (Johnson and Kaplan 1987, Myers 2010, Gupta and Baxendale 2008, Burns and Vaivio 2001, Bromwich and Bhimani 1989, Berliner and Brimson 1988, Kaplan 1988, Johnson

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1994, Cokins 1998, Lukka and Shields 2001). These researchers, among others, agree that the limitations inherent in traditional cost accounting practices result in serious product cost distortions which can lead to inappropriate operational and strategic decisions. To resolve these problems, an array of new approaches to cost accounting and product costing have been developed during the last two decades. Examples include Activity-Based Costing (ABC), Throughput Accounting (TA), or Lean Accounting (LA, Gurowka and Lawson 2007, Cokins and Hicks 2007). Each of these costing systems were created to meet specific objectives for cost accounting performance and strong emphasis was put on correctly capturing business processes and achieving correct inclusion of relevant manufacturing characteristics (Boons 1998).

The most notable criticism of the widely used traditional cost accounting system arises from Johnson and Kaplan (1987) who listed three major problems inherent in the system: 1) using direct labor to allocate overhead has become less appropriate in today's production environment; 2) direct labor-based cost calculations provide distorted data on product cost, potentially leading to erroneous decisions; and 3) the system focuses on short-term profit goals and thereby leads to misguided long-term decisions. Although the relevance and accuracy of traditional cost accounting has been widely criticized in the literature, prior research studies show that traditional cost accounting is still the most commonly used practice in most industries (Brierley et al. 2006). Indeed, many companies still allocate overhead costs on a direct labor basis (e.g., direct labor hour or direct labor cost), or on other volume-based metrics (e.g., machine hour, units produced, or production time), or use a blanket overhead rate (Brierley et al. 2001 and 2006).

While alternatives to traditional cost accounting systems exist, each alternative has to cope with its own peculiarities. Activity-based costing (ABC) accumulates overhead costs for each organizational activity first, then allocates costs of activities to particular products (Cokins and Hicks 2007) based on the product's consumption of resources (Culler and Burd 2007, Roztocki et al. 2004). Success stories from ABC implementation (Brierley et al. 2006, Kaplan and Atkinson 1998, Turney 1990, Cooper and Kaplan 1988) exist, however, poor implementation of activity-based allocation of costs can cause failures in producing tangible benefits (Morrow and Connolly 1991, Johnson 1992, Player and Keys 1997, Sharman 2003). Throughput Accounting (TA), introduced by Goldratt and Cox in 1992, claims that problems inherent with the traditional cost accounting system arise from distortions in product costs and also questions the use of product costs in general (Noreen et al. 1995, Corbett 1998). Moreover, Goldratt suggested that a change in management's thinking from a cost world to a throughput world is necessary (Holmen 1995). Throughput Accounting (TA) wants to provide a true reflection of actual revenues and costs (Blackstone and Cox 2005) and aims on increasing profitability by measuring throughput, inventory, and operating expenses (Noreen et al. 1995). Although the benefits of TA are well documented (Low 1992, MacArthur 1996), some authors (Bakke and Hellberg 1991, Holmen 1995) are questioning its applicability and effectiveness and suggest that TA should be used for short-term decision-making and ABC accounting for long-term decision-making. Lean Accounting (LA), another recently introduced cost accounting system, accommodates changes to operations made following the Lean philosophy. Lean accounting uses a single cost collector, called a Value Stream (Thomson 2007), and supports lean transformation efforts by providing accurate, up-to-date, and understandable information, while leading to increased customer value, growth, and profitability (Maskell and Baggaley 2003). However, lean accounting is a fairly new field of accounting, no prior research studies were found investigating the benefits and challenges of using lean accounting in an operation.

Empirical evidence exists that the North American hardwood dimension and component industry mainly uses traditional cost accounting methods to manage their accounting information. However, the traditional cost accounting system may no longer be appropriate for an industry where a large part of production is sourced offshore and where, therefore, most of the longer production runs of more common dimension and component products are no longer produced domestically. Thus, North American component manufacturers today have to focus on producing shorter runs of more customized products with very limited lead times. For shorter production runs to be feasible, quick changeovers are required. Tooling changes add substantially to production costs and can lead to distorted cost allocations. However, traditional accounting systems have been promoted and employed by the industry for decades and thus, change is slow coming. The component industry's first costing manual, created by the Wood Component Manufacturers Association (WCMA) for industrial use in 1956 (Kennedy and Noltmey 1965) and updated in 1985 (Carroll 1985) does rely on traditional cost accounting methods to guide industry practitioners.

Since over 25 years have passed since the industry's last effort to update its product costing systems, this research was undertaken to investigate the type and structure of product costing practices used by the North American hardwood dimension and components industry. The objective of this study thus was to gather information as to the type, structure, and reliability of the costing systems used in the North American

hardwood components and dimension industry and to gain insights as to the needs companies have related to product costing.

2. METHODOLOGY

A mail survey of participants of the North American hardwood dimension and component manufacturing industry was conducted to learn about practices, problems, and ideas to improve product costing systems within the industry.

2.1. SURVEY DESIGN

The Total Design Method (TDM, Dillman et al. 2008) was used to collect survey data for this research. The mail questionnaire consisted of 34 questions. In particular, 9 questions related to company information, 15 questions about company product costing systems, and 10 questions about products and markets. Questions were created based on industry input, existing literature, previous research studies, and help from academics and researchers at Virginia Tech and the USDA Forest Service. Questions included closed-ended inquiries, both categorical (nominal and ordinal scale) and numerical (five-point Likert-scale and ratio scale); partial open-ended inquiries, such as nominal scale multiple choice questions with “other” as an option; and open-ended inquiries with short answers.

2.2. SURVEY DATA COLLECTION

The address list used included 137 members of the Wood Component Manufacturers Association (WCMA) and another 232 firms operating in the hardwood component production sector, but not members of WCMA whose addresses were provided by WCMA (WCMA 2010). Also, 69 companies from the membership list of the Wood Product Manufacturers Association (WPMA 2010) were added to the address list and another 57 companies from the 2009 Virginia Industry Directory (DandB 2009) and from the Manta.com website (Manta 2010). Thus, a total of 495 contact companies were involved in this research, 447 in the U.S. and 48 in Canada.

A pretest survey was sent out to a randomly chosen group of five industry members to test the survey for overall quality, clarity, and comprehension (Rea and Parker 1997). Minor changes to the questionnaire were made based on the pretest feedback. The final version of the mail survey was sent to the remaining 490 companies in July 2010. The survey was addressed to a senior company manager, preferably the CEO or President. Each recipient received a personalized cover letter with an individual tracking number and pre-paid return postage was included in the mailing. Two weeks after the initial mailing, a follow-up postcard reminder was sent out to those potential respondents who had not yet replied. Four weeks after the initial mailing, a second mail survey, with questions identical to the first mailing was mailed to all non-respondents. The second mailing included a letter emphasizing the importance of responding (Rea and Parker 1997). Two weeks later, another follow-up postcard reminder was sent out to non-respondents. Eight weeks after the initial mailing, the survey process was closed.

2.3. DATA ANALYSIS

Mainly descriptive statistical analysis, including frequency counts, means, median scores, and standard deviations were used to gain a better understanding of the dataset. Additionally, non-parametric statistical analysis such as chi-square tests were used for non-response bias at the 95 level of significance.

2.4. LIMITATIONS OF THE STUDY

As do all mail surveys, the results obtained from this study process underlie some limitations that must be considered when reading the results (Alreck and Settle 2003). First, only one respondent from each company was contacted to answer the survey, creating single respondent bias (Blair and Burton 1987). Secondly, although a majority of the respondents were owners or CEOs of the company (70%), their involvement in product costing may be minimal. Thus, they may not be privy to all details pertaining to their product costing system. Also, while the target population of the survey was the hardwood dimension and component industry in North America, not all companies in this sector were identified and surveyed. Lastly, the relatively low response rate (16%) reduces the reliability of generalizing the findings of this study.

3. RESULTS AND DISCUSSION

Results from this mail survey targeting the North American hardwood dimension and components manufacturing industry are presented and discussed below.

3.1. SURVEY RESPONSE RATE

From the initial contact list, 7 companies refused to participate and an additional 37 surveys or envelopes were not deliverable due to closed businesses or incomplete addresses. A total of 74 valid responses were received, for an adjusted response rate (N=451) of 16%.

3.2. NONRESPONSE-BIAS

To test for non-response bias (Malhotra 1996), 31 non-respondents were contacted by phone and fax and were interviewed using five questions from the questionnaire after closing of the survey. These five questions included questions about company characteristics, such as main product category, geographical location, and sales volume in 2009 as well as subjective questions about the respondents company's costing system such as satisfaction rate with the information provided or how often problems arise from erroneous information. Verbal responses to these questions were recorded and entered into the database. A Pearson chi-square test was run for each of the five questions. Table 1 displays the results of these tests.

No significant differences were found in two company characteristics (geographical location and sales volume in 2009) and for the question "How would you rate the information provided by your current costing system?" between respondents and non-respondents (Table 1). However, significant differences were detected in the main product cost category as well as for the question "Do conflicts/problems arise from erroneous information provided by the costing system?" To support the conclusion provided by the Pearson chi-square test, z-test of two proportions were run and it was found that significantly less non-respondents categorized themselves as millwork manufacturers than respondents, and significantly more non-respondents categorized themselves as "other" manufacturer than respondents. Also, significantly more non-respondents reported that problems never arise from erroneous information provided by their costing system than respondents and significantly less non-respondents reported that problems occasionally arise from erroneous information provided by their costing system. No difference was found between respondents and non-respondents who reported that problems regularly arise from erroneous information provided by their costing system.

Table 1. Results from testing nonresponse-bias for costing survey.

#	Question	Test	Test-value	p-value	Result
1.	Please name the one category that best describes the main product (in terms of sales revenue) produced by your company.	Pearson Chi-Square	11.171	0.025	Significant difference
2.	Where is (are) your manufacturing facility (facilities) located?	Pearson Chi-Square	1.026	0.906	No significant difference
3.	What category represents the total annual wood products sales volume of your organization in the U.S. in 2009?	Pearson Chi-Square	7.093	0.214	No significant difference
4.	How would you rate the information provided by your current costing system?	Pearson Chi-Square	2.656	0.448	No significant difference
5.	Do conflicts/problems arise from erroneous information provided by the costing system?	Pearson Chi-Square	7.338	0.026	Significant difference

3.3. COMPANY CHARACTERISTICS

The Wood Component Manufacturing Industry is not an individual industry segment under the North American Industry Classification System (NAICS) but a cluster of companies classifying themselves under several segments. Forty-three percent of the respondents classified their business activity as Millwork Manufacturing (NAICS 32191), 12% as Kitchen, Bath Cabinet, or Countertops Manufacturing (NAICS 33711), 11% as Household and Institutional Furniture Manufacturing (NAICS 33712), 7% as Sawmill and Wood Preservation Manufacturing (NAICS 32111), 1% as Veneer Manufacturing (NAICS32121), and 1% as Office

Furniture (including fixtures, NAICS 33721). The “*Other*” category (NAICS 32192) contained 18 responses that included Wood Component Manufacturers (67%), Wholesalers (17%), and an Art and Design category (16%).

A majority of respondents, 72%, run a manufacturing business; 5% are involved in trading or brokering, while 23% of the respondents are involved in both activities. Thirty respondents reported to have less than 20 employees, 21 respondents employed between 20 and 49 workers, 14 had between 50 and 99 employees and the 9 remaining companies employed between 100 and 499 individuals. Seventeen companies reported a total annual wood products sales volume in 2009 between \$5.1 million and \$10 million, 41 companies having sales volumes at or below \$5 million, and 14 companies having total sales volumes of \$10.1 million or more. Eighty-five percent of the respondents reported that their total annual wood products sales volume in 2009 was smaller than it was in 2006.

Most responses were received from the Midwest region (31%) followed by the Northeast (30%), the South (27%), and the West (5%). Most respondents were working for companies located in Pennsylvania, followed by Virginia, Michigan, and Kentucky. Seven percent of all respondents reported that their companies have facilities outside of the U.S.

3.4. TYPE OF COSTING SYSTEM USED

Survey participants were asked what type of cost accounting system their company is using. As shown in Figure 1, the majority of the respondents (74%) reported that their company employed a traditional cost accounting system. Thirteen percent of respondents indicated that their company was using an activity-based cost accounting system (ABC), 4% a lean accounting system (LA), while 9% used a proprietary system (Figure 1).

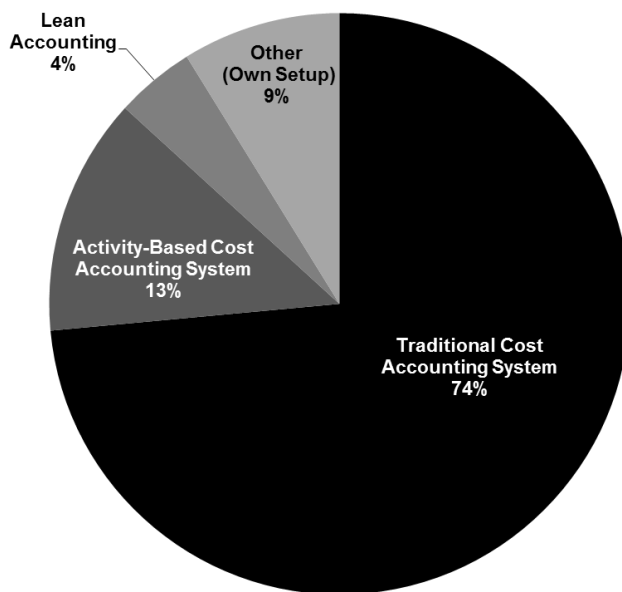


Figure 1. Type of cost accounting system used by survey respondents.

3.5. PURPOSE OF THE COSTING SYSTEM

Figure 2 shows the information that respondents companies’ cost accounting systems generate (Figure 2, “*Current system*”). Most respondents indicated that they used their cost accounting system mainly for financial information such as financial reporting (59 respondents), tax purposes and inventory valuation (47 each), and product costing (41 respondents). Fewer respondents indicated that their company used the information from their cost accounting system to gain operational information. Twenty-three respondents said that the information from their cost accounting system was used for performance benchmarking while 16, 15, and 9 respondents, respectively, indicated that the information was used for quality, value/non-value added, and

process improvement information (Figure 2, “Current system”). Surprisingly, few respondents stated that their companies were using the cost accounting information to collect strategic information, such as for the purpose of calculating target costs (31), to support making or buying decisions (21 respondents), making investment justifications (14), or assessing the life-cycle costs of a product (9, Figure 2, “Current system”).

However, most respondents also indicated that they would like to obtain more information from their company’s cost accounting system. Responses to the question inquiring as to what a “Perfect system” would provide are shown in Figure 2. If respondents would have a perfect system, 62 would use it for financial reporting, 57 for tax purposes, 64 for inventory valuation, and 65 for product costing purposes (Figure 2, “Perfect system”). Respondents also would rely more on their cost accounting system for operational information. Fifty-six respondents indicated that they would use their cost accounting system for creating performance indicators, while 52, 52, and 50 respondents, respectively, indicated that they would use the information for quality, value/non-value added, and process improvement information (Figure 2, “Perfect system”). In the strategic information category, 57 respondents wanted to use the system for target cost information, 50 for make or buy decisions, 46 for investment justification purposes, and 38 for life cycle cost assessments (Figure 2, “Perfect system”).

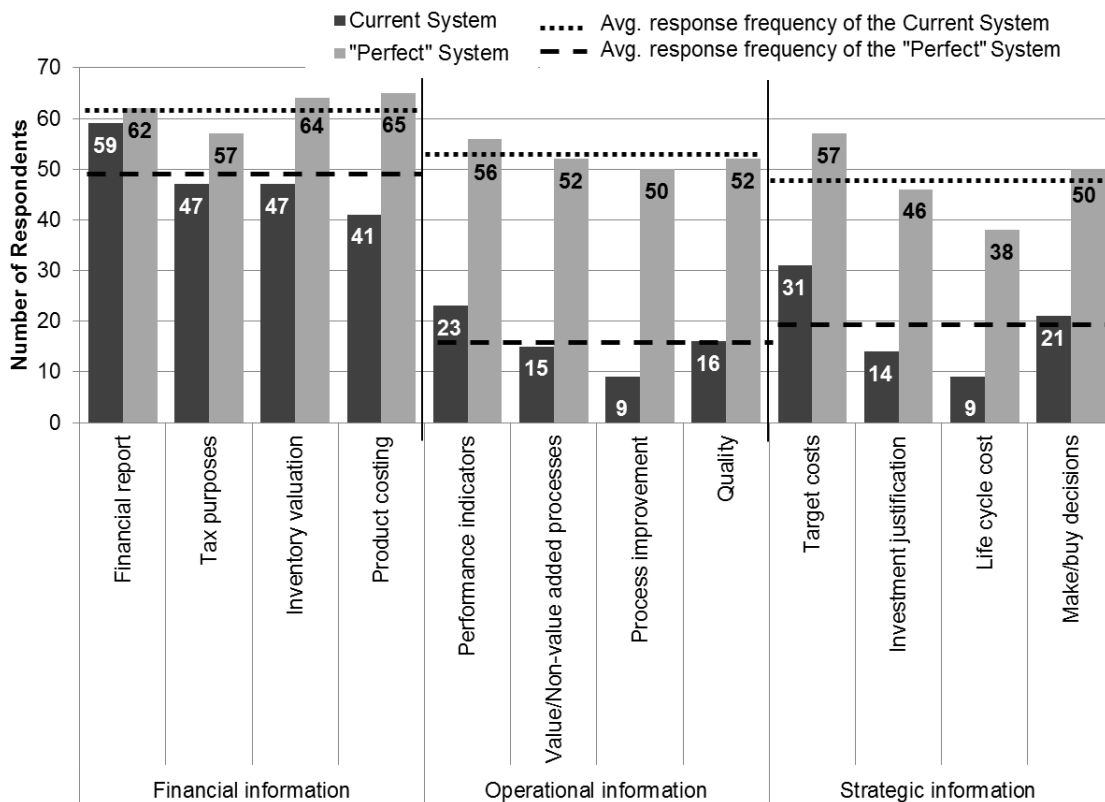


Figure 2. Information provided by the current vs. perfect costing system of respondents.

3.6. COMMON PROBLEMS WITH EXISTING COSTING SYSTEM

The questionnaire asked survey participants if their system misallocates overhead costs to high-volume and low-volume products, as happens with traditional cost accounting systems (Johnson and Kaplan 1987). Twenty-three out of 48 respondents who reported having a traditional cost accounting system indicated that they are aware of the problem. Interestingly, however, 6 out of 8 respondents who claimed that their company employs an ABC cost accounting system described the same problem. Given that the ABC system was designed to eliminate this problem, among other things, leads to uncertainty as to whether some respondents may have misclassified their system, misunderstood the question, or not implemented and used the ABC cost accounting system properly. One respondent whose company is using a Lean Accounting costing system (LA)

reported a problem with overhead allocation to individual jobs. However, 4 out of 6 of the companies reporting to use a proprietary cost accounting system reported to have problems with allocating overhead.

An often-raised criticism of cost accounting systems is that the costs to create and to maintain such systems are too high. Also, the time needed to maintain such systems is perceived as excessive by many industry practitioners. The survey asked the respondents if they feel that their company’s cost accounting system is too expensive and/or requires too much time and effort. Sixteen out of 48 traditional cost accounting users addressed this issue, while 4 out of 8 ABC users reported the problem. Among the Lean Accounting users, no one indicated that their system was expensive or time-consuming, while three out of six respondents using a proprietary costing system mentioned this problem.

Lean Accounting is a relatively new field. One of its major drawbacks is that it was designed primarily for companies that apply lean principles in their operation. Survey participants were asked whether they use visual performance measures on a performance board on the shop floor (e.g., hourly production, days of inventory, operational equipment efficiency, among others). The survey found that all companies employing Lean Accounting did employ visual performance measures on the shop floor. However, interestingly, 20 out of 48 traditional cost accounting system users also apply visual performance measures on the shop floor, as do 4 out of 8 ABC users, and 3 out of 6 companies with their own setup.

3.7. MAIN COST DRIVERS FOR COMPANIES

Survey respondents were asked about the main cost drivers of their company. Answers given by survey respondents using a Likert-scale from 1 (unimportant) to 5 (very important) are shown in Figure 3. Survey respondents ranked, with an average rating of 4.74, the costs of raw materials as the most important cost driver of their company. Costs of raw materials were followed by cost of labor (4.64), cost of operations (4.34), cost of inventory (3.86), scrap (3.72), repair work (3.13), environmental factors (2.65), and certification issues (2.37, Figure 3).

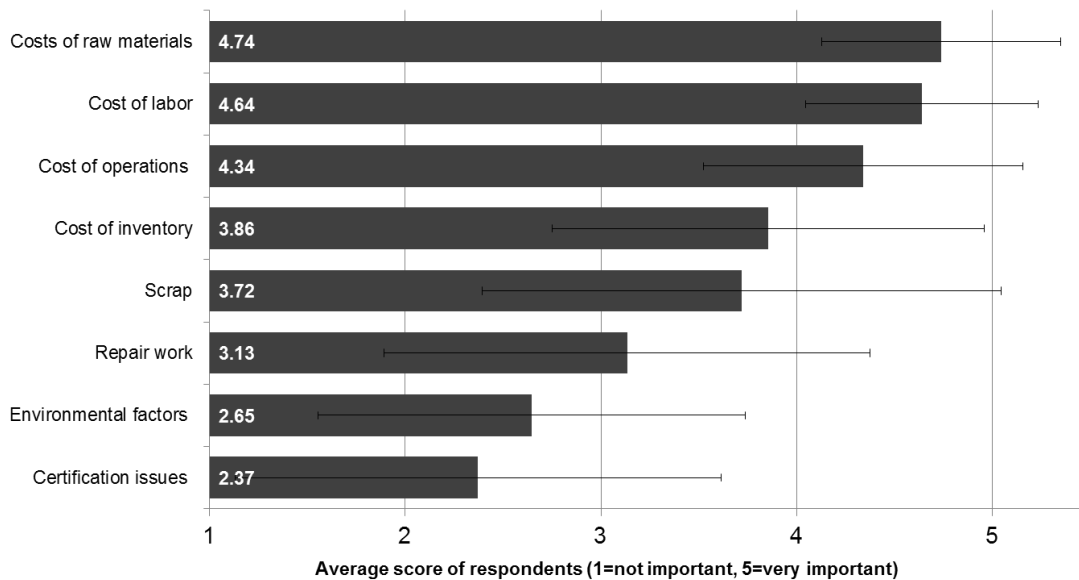


Figure 3. Main cost drivers in respondent’s company (bars represent ± one standard deviation).

3.8. IMPROVEMENTS TO COST ACCOUNTING SYSTEMS

Survey respondents were asked to use a Likert-scale ranging from 1 (not important) to 5 (very important) to indicate the extent to which various objectives were being met by their current cost accounting system (Figure 4, “Existing in Respondent’s System”). “Easily accessible,” “inexpensive to buy,” and “maintenance cost is low” were ranked with 2.44, 2.35, and 2.31 on the Likert scale, making them the objectives that survey respondents’ companies’ cost accounting systems best met. “Be an individual system” (2.29), “easy to operate” (2.27), “provide accurate cost information for management purposes” (2.21) “provide easily available, accurate,

up-to-date information for cost estimates” (2.20), and “easily customizable” (1.98) were objectives that respondents felt their cost accounting systems were meeting less successfully (Figure 4, “Existing in Respondent’s System”). The objective that respondents’ existing systems were least able to address was “be part of an MRP/ERP or other manufacturing system” (1.88), indicating that at least some of the current cost accounting systems used by the industry require considerable effort to be maintained.

When asked which attributes of their costing systems matter the most to respondents, “easy to operate” (4.52) was the most highly ranked (Figure 4, “Important to Respondents”). This attribute was more highly rated than “provide accurate cost information for management purposes” (4.44) “provide easily available, accurate, up-to-date information for cost estimates” (4.38), “easily accessible” (4.36), and “easily customizable” (4.30). Other items such as “maintenance cost is low” (3.70), “inexpensive to buy” (3.13), “be part of an MRP/ERP or other manufacturing system” (3.05), or “be an individual system” (2.75) were ranked less highly, but were still ranked higher than what respondents indicated their companies currently possessed. While relative levels of ranking for the existing systems (Figure 4, “Existing in Respondent’s System”) as well as for the “perfect” system (Figure 4, “Important to Respondents”) indicate levels of preference by respondents, the striking part of Figure 4 is the difference between the current performance of their product costing systems (Figure 4, “Existing in Respondent’s System”) and the level of importance (Figure 4, “Important for respondents”) they assign to these attributes.

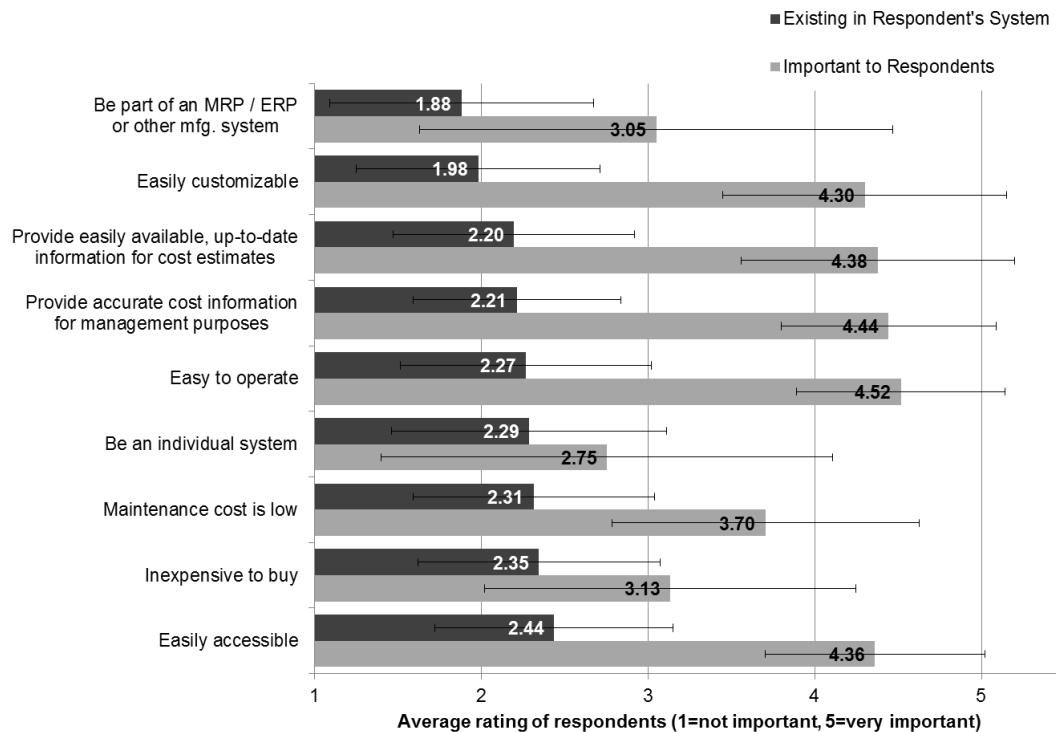


Figure 4. Objectives of respondents’ product costing system in the current system (“applied”) and importance (bars represent ± one standard deviation).

4. SUMMARY AND CONCLUSIONS

Three-fourths of North American hardwood dimension and components manufacturers responding to a mail survey conducted in 2010 indicated that their businesses are relying on traditional cost accounting systems. Other systems, like activity-based cost accounting systems (ABC), Lean Accounting systems (LA), or proprietary systems, were used by 13%, 4%, and 9% of respondents, respectively. Respondents indicated that the main cost drivers for their companies were: 1) cost of raw materials, 2) cost of labor, 3) cost of operations, 4) cost of inventory, 5) cost of scrap, 6) cost of repair work, 7) cost of environmental factors, and of least

importance, 8) cost of certification issues. Most respondents indicated that their cost accounting systems served primarily for financial reporting, tax, inventory valuation, and product costing purposes. Less than half of the respondents' companies' also used their cost accounting system for operational information and even fewer for strategic purposes. However, over 80% of respondents would like to obtain more financial, operational, and strategic information from their systems.

Respondents were somewhat aware of the cost allocation problems of traditional accounting systems. About half of traditional cost accounting systems users indicated awareness of cost misallocation issues associated with their costing systems. More surprisingly, 75% of respondents using an activity-based cost accounting system described the same misallocation problem. Unfortunately, the survey did not offer any insights as to why cost allocation problems should exist in activity-based cost accounting systems. Only one user of Lean Accounting systems reported similar cost allocation problems but four out of six users of proprietary systems did. It appears that the industry could use guidance from experts as to how to best deal with cost allocation issues.

The costs and efforts required to maintain cost accounting systems is a concern to some of the industry's participants. About a third of traditional cost accounting systems users indicated that their systems are too expensive and time consuming to maintain, while half of activity-based and proprietary cost accounting systems users indicated the same problem. No company using a Lean Accounting system indicated a problem with the costs or the time required for their systems. However, since Lean Accounting is a relatively new system, results could be explained in two different ways: 1) survey participants using Lean Accounting systems may not have enough experience to judge the accuracy of their systems or 2) Lean Accounting systems are, in fact, more efficient than other systems.

Members of the North American hardwood dimension and components industry responding to the survey also indicated that their current systems do not provide all the positive attributes that they would expect from a "perfect" system. A "perfect" system would be, in descending order of importance: 1) an "easy to operate" system, 2) "provide accurate and useful cost information for management purposes," 3) "provide easily available, accurate, up-to-date information for cost estimates," 4) an "easily accessible" and "easily customizable" system. Other items, such as "maintenance cost is low," "inexpensive to buy," "be part of an MRP/ERP or other manufacturing system," or "be an individual system," were ranked less highly, but still higher than what respondents reported their current systems deliver.

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