Activity-Based Costing for E-Business

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Abstract-This paper proposes the use of Activity-Based Costing to more effectively track costs associated with E-Business. The usefulness to E-Business of Activity-Based Costing, already proven to be beneficial to manufacturing companies, is discussed. The author's extensive experience with "New Economy" business, as well as Activity-Based Costing issues in traditional "brick-and-mortar" companies, lead to the development of an Activity-Based Costing system for an Internet-based sports-goods superstore. The implementation procedure for this company can be used as an example for other E-Businesses interested in using Activity-Based Costing. Finally, this paper examines several possible benefits to the strategic decision-making process and financial performance of E-Businesses, as a direct result of implementing Activity-Based Costing.

1. INTRODUCTION

Technology companies, part of the so-called "New Economy," are playing an increasingly important role in the global economy. In their zeal to grow and outperform their competitors, many of these companies measure success by number of customers or percentage of market shares, rather than real dollars earned. They follow the expectation that numerous customers or high market shares captured today will automatically lead to profit tomorrow. Since many newer E-Companies disregard real dollar amounts and are affected by high start-up costs, they are not able to produce profit, let alone generate enough money to pay dividends. They are particularly dependent on investors' expectations about future business performance. Only if projections meet or exceed investors' expectations does the necessary capital flow into the E-Company.

Unfortunately, many E-Companies find themselves in a position where it is increasingly difficult to obtain the capital necessary for expansion and comfortable financial stability. High-tech companies are forced to compete for scarce capital lured from reluctant investors. In order to convince potential investors to invest in their companies, E-Managers must present better business plans, more promising technologies, or more advanced strategic managerial tools. In other words, they must convince investors that their revenues will eventually exceed their costs, resulting in profit and the ability to pay out dividends. Activity-Based Costing (ABC) is one system which can help E-Managers to better control costs, and move their companies from the status of risky, fledging ventures operating on expectation, to stronger, more stable, and more profitable enterprises.

ABC, which was introduced in the late 1980's, was mainly implemented in manufacturing companies who found that they needed a new costing system in order to survive [3,6,7,10]. These companies recognized that their current way of allocating costs was leading them toward gradual financial ruin. Financial advisers and academic researchers who observed this devised the ABC system and introduced it to the struggling manufacturers, who embraced its more accurate costing methodology. The precarious position of manufacturing companies in the late 1980's is similar to the current struggle of E-Companies, whose financial stability and survival depends on the introduction of an effective costing system, such as ABC.

In the ABC system, costs are traced to cost objects in a two-stage procedure, using cost drivers [1,2,3]. In the first stage, a company's overhead costs are traced to activities. Administrative salaries, insurance, rent, and transportation are some examples of overhead costs. In the second stage, costs are traced from activities to cost objects (such as products, processes, services, or customers). Some examples of cost drivers are engineering hours, number of setups, number of production runs, and number of customer contacts. Because of this two-stage methodology and the use of multiple cost drivers, ABC outperforms the traditional costing system, which uses only a single cost driver (usually direct-labor hours).

Since its introduction, the ABC system has been successfully implemented in many large manufacturing companies. Managers armed with the ABC system were able to lower costs, determine a more profitable product mix, and identify opportunities for improvement [5]. However, despite the fact that the ABC system is already very

popular among manufacturing companies, widely-known published reports about its use in E-Business do not currently exist.

Therefore, this paper examines the implementation of the ABC system in E-Companies, offering a general step-by-step ABC implementation procedure for the New Economy.

2. METHODOLOGY

2.1 Implementing the ABC System

The ABC System is especially valuable for E-Companies, which tend to have high overhead costs. Expenses such as administrative salaries, office supplies, software and hardware maintenance, and employee training are defined as "overhead" or "indirect expenses." Unlike direct expenses, these expenses cannot be directly associated with a particular product or customer. To help individual companies from the New Economy decide if an ABC system has the potential to improve the reliability of their cost information, one must calculate the ratio of their overhead cost to their total cost. The *OT* (Overhead to Total) ratio can be calculated as follows:

$$OT\ ratio = Overhead\ Cost / Total\ Cost \quad (1)$$

For companies with overhead expenses accounting for more than 30 % of their overall expenses (resulting in an *OT ratio* higher than 0.3), management should consider implementing an ABC system. In general, the higher the *OT ratio* the higher the level of distortion in cost estimates. The author's experience with New Economy firms indicates that those companies with an *OT ratio*, higher than 0.3 experience an unacceptable level of distortion in cost information. However, the value of 0.3 is expected to be refined as research progresses.

2.2 Implementation Methodology

The ABC implementation methodology for companies engaged in E-Commerce, as illustrated below, is very similar to the procedure initially developed for small manufacturing companies [10]. The proposed implementation methodology was adjusted to fit the specific needs of companies in the New Economy, by selecting different cost drivers and different activities. The implementation can be performed in six major steps [10].

Step 1: Determine overhead cost

Almost all of the information needed to perform the analysis can be obtained from the company's income statement, which is needed to determine overhead cost. During this step, all expenses included on the income statement are classified as either "direct" or "overhead." Expenses which can be associated with a particular cost object are "direct." Expenses which can not be associated with a particular cost object are defined as "overhead."

Step 2: Identify main activities

During this step, the main business activities (which cause overhead expenses) are identified. Examples of these activities include Web site design and maintenance, order processing, marketing, telephone support, product handling, product shipping, and payment collection. A few of these main activities are important to both traditional and New Economy companies, however, some are crucial to E-Businesses in particular, due to the nature of marketplace demand. Examples of these activities may include employee duties and strategic decision-making. Many E-Companies are struggling to hire and retain highly-qualified programmers, which increases the necessity of employee incentives and support, for example. Strategic-decision making is extremely important as well, because even one poor decision move during the set-up of an E-Company may easily lead to bankruptcy.

Step 3: Determine overhead cost of each activity

During this step, overhead cost is calculated for each activity. To systematically relate activities to expenses and determine their overhead consumption, the Expense-Activity-Dependence (EAD) matrix can be used [10]. (To learn more about using matrixes to trace cost, interested readers are referred to the cited literature.)

Step 4: Select cost drivers

Selection of operating cost drivers is performed in a manner similar to that in the implementation of ABC in a traditional manufacturing company. Factors such as the availability of data required by a cost driver, and the degree of correlation between the cost driver and the consumption of activities by a cost object, should be considered when choosing operating cost drivers [4]. These cost drivers are then used to trace costs, linking activities to cost objects.

Step 5: Calculate overhead cost of each cost object

To systematically relate activities to cost objects and to identify the cost object's overhead consumption rate, the Activity-Product-Dependence (APD) matrix can be used [10].

Step 6: Calculate product cost of each cost objects

Finally, the direct and overhead costs of each cost object are added together in order to obtain the product cost. Once the product cost is calculated, it can be used to judge profitability, make well-founded pricing decisions, identify opportunities for cost savings, introduce a new product line, or drop an existing one.

3. APPLICATIONS EXAMPLE

3.1 ExampleSport.com

ExampleSport.com (whose name has been changed to protect anonymity) is a multi-category Internet superstore, offering a selection of brand-name sports goods, such as athletic and outdoor footwear, athletic apparel, skateboards, snowboard equipment, and ski equipment. ExampleSport.com offers these products in a convenient, user-friendly, Web-shopping interface, which features extensive product information and multimedia presentation. The company's Web site is designed to offer the customer online shopping opportunities 24 hours a day, seven days a week.

The company was organized in July 1997 and began offering products for sale through its Web site in November 1997. During this time, ExampleSport.com hired more than 40 full and part-time employees. ExampleSport.com is run by a management team, while a group of venture investors provides the necessary capital.

Before the field study, ExampleSport.com was using a traditional costing system. Overhead, which comprised 50 percent of ExampleSport.com's overall expenses, was allocated based on direct cost. In addition, management justified the company's business success by factors such as growth in revenues, growth in customer numbers, and a reduced number of customer complaints.

3.2 Implementation and Analysis of ABC for ExampleSport.com

The implementation of ABC in ExampleSport.com started with the analysis of its income statement. All entries on the income statement were classified as "direct" or "overhead" expenses. Table 1 presents ExampleSport.com's overhead expense categories. In the following illustration, the accounting numbers have been simplified.

TABLE 1
OVERHEAD EXPENSE CATEGORIES

Expense Category	Cost
Rent	$100,000.00
Depreciation	$25,000.00
Utilities	$75,000.00
Administration	$220,000.00
Product Development	$100,000.00
Sales and Marketing	$150,000.00
Hardware Maintenance	$45,000.00
Software Maintenance	$80,000.00
Office Expenses	$50,000.00
Employee Training	$20,000.00
Product Shipment	$100,000.00
Miscellaneous	$20,000.00
Total	**$1,000,000.00**

In the second step, ExampleSport.com's major business activities (a total of 13) were identified. Table 2 shows these activities.

TABLE 2
EXAMPLESPORT.COM'S MAIN ACTIVITIES

Activity
Advertise Products (Marketing)
Contact Customers
Develop and Maintain Web Pages
Maintain Customer Database
Acquire Goods
Receive and Handle Goods
Monitor Quality
Prepare Goods for Shipment
Ship Goods
Manage Customer Orders
Manage Customer Payments
Service Customers
Manage Business

In the third step, the cost of each activity was determined using the Expense-Activity-Dependence (EAD) matrix [10]. As mentioned in the methodology section, readers who wish to know more about using matrixes to trace costs are referred to the cited literature. Table 3 presents the cost of each activity.

TABLE 3
COST FOR EACH ACTIVITY

Activity	Activity Cost
Advertise Products (Marketing)	$190,000.00
Contact Customers	$45,000.00
Develop and Maintain Web Pages	$185,000.00
Maintain Customer Database	$35,000.00
Acquire Goods	$105,000.00
Receive and Handle Goods	$35,000.00
Monitor Quality	$40,000.00
Prepare Goods for Shipment	$65,000.00
Ship Goods	$75,000.00
Manage Customer Orders	$40,000.00
Manage Customer Payments	$30,000.00
Service Customers	$60,000.00
Manage Business	$95,000.00
Total	**$1,000,000.00**

In the fourth step, cost drivers for each activity were identified. Table 4 displays operating cost drivers for ExampleSport.com's 13 major business activities.

TABLE 4
EXAMPLESPORT.COM'S MAIN ACTIVITIES AND COST DRIVERS

Activity	Cost Driver
Advertise Products (Marketing)	Number of Advertisements Launched
Contact Customers	Number of Customers Contacted
Develop and Maintain Web Pages	Number of Development Hours Spent
Maintain Customer Database	Number of Maintenance Hours Spent
Acquire Goods	Number of Purchase Orders
Receive and Handle Goods	Number of Items Received
Monitor Quality	Number of Inspections
Prepare Goods for Shipment	Number of Products Packaged
Ship Goods	Product Weight
Manage Customer Orders	Number of Orders Processed
Manage Customer Payments	Number of Payments
Service Customers	Number of Customer Communications
Manage Business	Intensity of Activity

In the fifth step, ExampleSport.com's overhead was traced to its cost objects (or major product lines) using the Activity-Product-Dependence (APD) matrix [10]. Table 5 presents the traced overhead cost for each of ExampleSport.com's six major product lines.

TABLE 5
ACTIVITY-BASED COSTING ESTIMATED OVERHEAD COST

Cost Object	Overhead Cost
Skateboards	$120,000.00
Ski Equipment	$140,000.00
Snowboards	$170,000.00
Athletic Apparel	$250,000.00
Sports Footwear	$270,000.00
Miscellaneous	$50,000.00
Total	**$1,000,000.00**

Finally, in the sixth step, the product cost for each of ExampleSport.com's cost objects was calculated. In this calculation, the previously traced overhead costs for each product line were added to the direct cost. Table 6 presents the estimated product cost for each product line.

TABLE 6
ACTIVITY-BASED COSTING ESTIMATED PRODUCT COST

Cost Object	Direct Cost	Overhead Cost	Product Cost
Skateboards	$210,000.00	$120,000.00	$330,000.00
Ski Equipment	$225,000.00	$140,000.00	$365,000.00
Snowboards	$305,000.00	$170,000.00	$475,000.00
Athletic Apparel	$110,000.00	$250,000.00	$360,000.00
Sports Footwear	$115,000.00	$270,000.00	$385,000.00
Miscellaneous	$35,000.00	$50,000.00	$85,000.00
Total	**$1,000,000.00**	**$1,000,000.00**	**$2,000,000.00**

The figures for ABC-traced product cost and traditionally calculated product cost showed substantial differences. Table 7 presents product cost estimates obtained from both systems.

TABLE 7
PRODUCT COSTS: TRADITIONAL COST ALLOCATION VS. ACTIVITY-BASED COSTING ANALYSIS

Cost Object	Traditional	ABC	ABC vs. Traditional
Skateboards	$420,000.00	$330,000.00	-$90,000.00
Ski Equipment	$450,000.00	$365,000.00	-$85,000.00
Snowboards	$610,000.00	$475,000.00	-$135,000.00
Athletic Apparel	$220,000.00	$360,000.00	+$140,000.00
Sports Footwear	$230,000.00	$385,000.00	+$155,000.00
Miscellaneous	$70,000.00	$85,000.00	+15,000.00
Total	**$2,000,000.00**	**$2,000,000.00**	**$0.00**

Although the calculation of total product cost for ExampleSport.com ($2,000,000.00) remained the same for both systems, there were substantial differences between the estimates for particular product lines. For "Athletic Apparel" and "Sports Footwear," ABC-traced overhead costs were higher than overhead costs allocated by the traditional system. On average, these two product lines demanded relatively high dedication of ExampleSport.com's overhead resources. One reason was that there was a high rate of return in these product lines, which contributed to high restocking, receiving, and refund expenses. Another was that most of ExampleSport.com's footwear was manufactured by independent producers who were located overseas. This led to time-consuming coordination and intensive import and export paperwork on the part of ExampleSport.com's administration, and thus, resulted in high overhead. In addition, the models of footwear offered changed rapidly. This resulted in an on-going need for Web site maintenance where obsolete models were removed, and new ones added. (Such measures were necessary as failure to offer the latest model would have had a negative impact on the company.)

On the other hand, in their "Ski Equipment" and "Snowboards" product lines, the company was able to develop and maintain satisfactory relationships with their vendors. ExampleSport.com was able to establish contracts with a few reliable suppliers, who guaranteed the on-going availability of high quality products. These contracts with dependable vendors made it possible for ExampleSport.com to dedicate relatively few overhead resources to these product lines.

The "Miscellaneous" product line, which was mainly comprised of small and relatively inexpensive items such as sunglasses, helmets, and fitness accessories, demanded greater dedication of resources, which resulted in high overhead. Because of this, the ABC cost estimate for this product line was higher than the traditional cost allocation, which was based solely on direct cost.

Given the outcome of this analysis, it is evident that ExampleSport.com needs to make changes in their current cost structure. There are many options open to ExampleSport.com for doing so. One option could be to

develop more favorable long-term relationships with vendors in troubled product lines, such as “Sports Footwear.” This strategy might help to reduce overhead expenses. Another option could be to improve the efficiency of the resources dedicated to this product line. Still another option (though perhaps not very easy to execute in light of competition) could be to increase the selling price of under-performing products. Finally, ExampleSport.com could consider dropping its less-profitable product lines in order to dedicate “freed” overhead resources to more promising ones.

Essentially, the most important point about using ABC cost estimates is that managers are challenged to act decisively about underperforming product lines. ABC does not carry out improvements, but rather points out the information most vital to making them.

4. CONCLUSIONS

The previous case study shows that ABC is useful not only to manufacturing companies, but also to companies from the New Economy. These companies often experience high overhead costs, which, when not properly traced, may lead to erroneous cost information.

For companies from the New Economy, the ABC System is a very promising managerial tool for several reasons. First, this system is able to provide managers with reliable cost information. With this information, managers are able to establish better pricing policies, for example. Second, ABC helps managers to identify the source of each of their expenses. Once knowledgeable about the sources of their expenses, they are better able to find ways to cut costs. Third, ABC helps managers to determine the course of their business activities. For example, management would be able to make well-founded decisions about introducing new products, or discounting unprofitable ones.

Overall, it is expected that E-Businesses would benefit from ABC implementation. For many E-Businesses, the ABC system could be one important step in a chain of improvements. For example, the next logical step for an E-Company, after ABC implementation, would be up-grading the ABC system to the Integrated ABC-and-EVA Information System, by adding an Economic Value Added component [9] and using an Information System [8]. This sophisticated costing and performance measure system would build upon the initial improvements made by the implementation of ABC.

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