

# Activity-Based Costing for E-Commerce

**Narczyz Roztocki**  
**State University of New York at New Paltz**  
**School of Business**  
**75 South Manheim Boulevard, New Paltz, NY 12561**  
**845-257-2930 (phone) / 845-257-2947 (fax)**  
**roztockn@newpaltz.edu**

## Abstract

This paper proposes a customized Activity-Based Costing system for companies engaged in e-commerce. The system is intended to more effectively track overhead costs particular to e-commerce. A case study of a Business-to-Customer (B2C) company is used to illustrate the process of system conception and implementation, and ongoing cost analysis. Finally, this paper examines several possible benefits to cost control, profitability assessment, and the efficiency of corporate strategy, as a direct result of implementing the proposed Activity-Based Costing system.

## Keywords

Activity-Based Costing, Cost Control, Costing System, Customer Profitability, E-Commerce

## 1. Introduction

Since 2000, the initial optimism about e-commerce and the “New Economy,” popularly called “dot-mania,” has evolved into widespread pessimism about its future prospects. Many “promising” dot-com start-ups have gone out of business, and others are on the edge of bankruptcy. In some cases, their failure can be traced to an unrealistic business model, such as heavy dependence on online advertising as the main source of revenues. In other cases, there was a discrepancy between the modest revenues from online sales and the exploding cost of maintaining day-to-day business operations. Many had assumed that e-companies were somehow exempt from the business principles of traditional “brick-and-mortar” companies. Yet, though e-commerce does possess a special set of considerations and problems, the essentials of balancing earnings and expenses still apply. This realization, that the New Economy is still bound by the business rules of the old, has prompted a reexamination of its strategies, its business models, and the overall efficiency of its costing systems.

The current situation of struggling dot-coms confirms the fundamental economic principle that in order to experience long-term prosperity, an organization must create quality revenues (those which are stable and relatively risk free) and keep costs under revenues. Companies from the New Economy, similar to those of the “old,” must have a reliable costing system to maintain enough of a margin between revenues and costs. Activity-Based Costing (ABC) is one system which has already proven successful in keeping costs under control for traditional “brick-and-mortar” companies.

In the late 1980’s, ABC was mainly implemented in manufacturing companies, as a replacement for obsolete and inefficient costing systems [3,7,10]. During this time period, many managers recognized that the inappropriate allocation of overhead, or “indirect costs”, often lead them to make poor decisions. Not knowing actual product costs had caused them to focus on products, markets, or customers which were, in reality, unprofitable. Profitability was often an illusion produced by flaws in their traditional costing systems.

As compared to traditional costing systems, ABC is more reliable in determining profitability because of the use of a two-stage procedure in tracing overhead to cost objects (such as products, processes, services, and/or customers) [1,2,3,4,5]. In the first stage, a company’s overhead is traced to activities. In the second stage, costs are traced from activities to cost objects. Because of this two-stage methodology and the use of activities as a medium to trace costs, as well as use of multiple cost drivers, ABC outperforms the traditional volume-based costing systems.

Using the information provided by ABC, companies are able to cut costs, review pricing policies, identify opportunities for improvement, and determine a more profitable product mix [6]. In addition, the output of the ABC

analysis is a good basis for revising corporate strategies, especially in cases where the daily business environment changes rapidly, or new competitors appear, or customers are highly demanding. These conditions are typical for companies of the New Economy. Therefore, it appears that ABC would be a good managerial tool for companies involved in e-commerce.

Despite the fact that the ABC system appears to be a very suitable managerial tool for e-commerce, widely-known published reports about its use in the New Economy do not currently exist. Therefore, this paper takes up the subject of ABC implementation, with an understanding of its importance and impact on the world of e-commerce. A step-by-step implementation procedure is provided as an example of a successful application of the system in e-commerce.

## **2. 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 implementation can be performed in six major steps.

### ***Step 1: Establish Objective and Requirements of the ABC System***

First, management must decide upon the main objective of the costing system. A costing system, for example, can be used to control costs, establish pricing policies, or assess inventory. In addition, management must decide upon the level of accuracy and reliability required of their costing system. The higher the level of accuracy, the higher the effort and cost of data collection.

### ***Step 2: Identify Main Activities***

During this step, the main activities (which cause overhead expenses) are identified. Examples of these activities include Web site design and maintenance, order processing, product marketing, telephone support, product handling, and product shipping. The number of main activities identified (and used as a medium to trace overhead) is determined by the level of accuracy and reliability desired.

### ***Step 3: Trace Overhead to Activities Using the Expense-Activity-Dependence (EAD) Matrix***

Expenses which can be associated with a particular cost object are considered “direct.” Expenses which can *not* be associated with a particular cost object are defined as “overhead.” Overhead, which is the focus of the ABC analysis, is traced to main activities, during step 3. To systematically relate activities to expenses and determine their overhead consumption, the Expense-Activity-Dependence (EAD) matrix can be used [10]. (An example of the use of the EAD matrix to trace overhead is illustrated in the Application Example section. For additional information about using matrixes to trace cost, interested readers are referred to the cited literature.)

### ***Step 4: Trace Overhead to Cost Objects Using the Activity-Product-Dependence (APD) Matrix***

In step 4, overhead costs are traced from activities to cost objects. (Cost objects, remember, are objects of particular interest in the cost analysis, such as products, processes, services, and/or customers.) To systematically relate activities to cost objects and then to identify the cost object’s overhead consumption rate, the Activity-Product-Dependence (APD) matrix can be used [10].

### ***Step 5: Calculate product cost of each cost object***

During this step, the direct and overhead costs of each cost object are added together, in order to obtain the product cost. The product cost represents an estimate of the *actual* expenditure on the part of a company to generate a cost object, rather than the cost of that object to a customer.

### ***Step 6: Use the ABC Analysis for Strategic Decision-Making and Improvements***

Once the product cost is calculated, it can be used to judge profitability, make informed pricing decisions, identify opportunities for cost savings, drop unprofitable product lines, or introduce more promising ones. Product cost information alone as provided by the ABC system, would not automatically lead to better business performance. Rather, armed with the ABC analysis, the decision-makers would be challenged to properly interpret the data and use it to improve the efficiency of their business.

### 3. Applications Example

#### 3.1 SuperTools.com

SuperTools.com (whose name has been changed to protect anonymity) is a Business-to-Customer (B2C) company selling quality tools. The majority of the tools are ordered on line or by e-mail, however, a substantial amount is also ordered by phone. SuperTools offers a large selection of quality tools on its easy-to-use Web site. Offered merchandise includes cutting tools, measuring tools, clamps, wrenches, safety gear, and work-related apparel. Generators, small engines, pressure washers, and pumps are also offered on-line. SuperTools.com does not offer a printed catalog. The ordered items are shipped to the customers via standard delivery service by ground freight companies. Large and/or heavy items are shipped by truck or sometimes by air cargo.

Since its inception in early 1998, SuperTools.com, which was a typical Internet start-up with no customer base, has competed with both traditional vendors and on-line stores, mainly for lowest price and highest reliability. To establish a reasonable customer base, SuperTools.com performed aggressive marketing. In addition, a significant reduction in price for new customers was offered. Because of this strategy, management was of the opinion that initial sales were not profitable enough to cover the cost of acquiring new customers, in light of marketing expenses and price reductions. SuperTools.com's management estimated that the acquisition costs were approximately \$100.00 per new customer, on average.

Currently, SuperTools.com is generating an overall loss of approximately \$200,000.00 per quarter. In the management's opinion, this loss can be attributed mainly to the high acquisition costs for new customers. Because of SuperTools.com's relatively small profit margins, the management was of the opinion that multiple orders from returning customers were needed to fully recover the acquisition costs. Up until now, SuperTools.com's management has applied a strategy based on the assumption that today's "unprofitable" customer will be tomorrow's profitable one. The company has expended most of their capital and effort on acquisition rather than retention. However, only if SuperTools.com is able to retain its customers it will be able to be profitable.

Although the current cash reserves will allow SuperTools.com to absorb deficits and continue business operations for approximately two more years, the management has been put under extreme pressure by venture investors to demonstrate their ability to produce profits in the near future. Therefore, the main objective of the ABC analysis for SuperTools.com was to determine if their long-term customers were indeed more profitable than newly acquired ones. In other words, to determine if there was a positive relationship between customer profitability and customer loyalty. Further, the analysis sought to determine whether or not these long-term customers were profitable enough to enable SuperTools.com to eventually generate profits in the future. In the following analysis, all customers were classified according to how long they had been ordering products from SuperTools.com. The information pertaining to the customers, as cost objects, is summarized in Table 1.

Table 1. Customer Classification According to Length of Patronization

Customers	Length of Patronization
New	Less than 3 months
Short-term	3 months to 1 year
Mid-term	1 year to 2 years
Long-term	More than 2 years

#### 3.2 Implementation and Analysis of ABC

The ABC analysis in SuperTools.com began with the screening of its most recent quarterly income statement for overhead expenses. Table 2 presents a list of SuperTools.com's major overhead expenses.

Table 2. Overhead Expense Categories

Expense Category	Cost
Administration	\$160,000.00
Rent and Utilities	\$75,000.00
Sales and Marketing	\$170,000.00
Hardware Maintenance	\$30,000.00
Software Maintenance	\$35,000.00
Office Expenses	\$45,000.00
Product Shipment	\$60,000.00
Miscellaneous	\$25,000.00
<b>Total</b>	<b>\$600,000.00</b>

In the second step, SuperTools.com's major business activities were identified. Overall, eight major activities were identified for use in the following analysis. Table 3 shows these activities.

Table 3. SuperTools.com's Major Business Activities

Activity
Advertise Products (Marketing)
Maintain Web Pages
Manage Customer Orders
Manage Customer Inquiries
Acquire Goods
Receive and Handle Goods
Monitor Quality
Prepare Goods for Shipment

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 4 presents the cost of each activity.

Table 4. Expense-Activity-Dependence (EAD) Matrix (\$1,000)

Activity	Expense Category								Total Activity Cost
	Administration	Rent and Utilities	Sales and Marketing	Hardware Maintenance	Software Maintenance	Office Expenses	Product Shipment	Miscellaneous	
Advertise Products (Marketing)	0.10	0.10	0.70			0.20		0.10	154.0
Maintain Web Pages	0.10	0.10		0.80	0.80	0.20		0.10	87.0
Manage Customer Orders	0.20	0.10	0.10	0.10	0.10	0.20		0.20	77.0
Manage Customer Inquiries	0.10	0.10		0.10	0.10	0.20		0.20	44.0
Acquire Goods	0.20	0.10	0.20			0.20		0.20	87.5
Receive and Handle Goods	0.10	0.20						0.10	33.5
Monitor Quality	0.10	0.10						0.10	26.0
Prepare Goods for Shipment	0.10	0.20					1.00		91.0
<b>Total Expenses</b>	<b>160.0</b>	<b>75.0</b>	<b>170.0</b>	<b>30.0</b>	<b>35.0</b>	<b>45.0</b>	<b>60.0</b>	<b>25.0</b>	<b>600.0</b>

In the fourth step, SuperTools.com's overhead was traced to its cost objects (or customers grouped according to the length of their patronization) using the Activity-Product-Dependence (APD) matrix [10]. Table 5 presents the traced overhead.

Table 5. Activity-Product-Dependence (APD) Matrix (\$1,000)

Cost Object	Activity								Total Overhead Cost of each Object Cost
	Advertise Products (Marketing)	Maintain Web Pages	Manage Customer Orders	Manage Customer Inquiries	Acquire Goods	Receive and Handle Goods	Monitor Quality	Prepare Goods for Shipment	
New	1.00	0.25	0.28	0.70	0.27	0.25	0.25	0.27	<b>291.18</b>
Short-term		0.25	0.25	0.10	0.24	0.26	0.25	0.24	<b>103.45</b>
Mid-term		0.25	0.24	0.10	0.25	0.25	0.26	0.24	<b>103.48</b>
Long-term		0.25	0.23	0.10	0.24	0.24	0.24	0.25	<b>101.89</b>
<b>Total Expenses</b>	<b>154.0</b>	<b>87.0</b>	<b>77.0</b>	<b>44.0</b>	<b>87.5</b>	<b>33.5</b>	<b>26.0</b>	<b>91.0</b>	<b>600.00</b>

In the fifth step, in order to obtain the product cost for SuperTools.com's cost objects, the previously traced overhead costs for each customer group were added to the direct cost. Table 6 presents the estimated product cost for each customer group.

Table 6. Estimated Product Cost for each Customer Group

Cost Object	Direct Cost	Overhead Cost	Product Cost
New	\$156,000.00	\$291,180.00	\$447,180.00
Short-term	\$147,000.00	\$103,450.00	\$250,450.00
Mid-term	\$145,000.00	\$103,480.00	\$248,480.00
Long-term	\$152,000.00	\$101,890.00	\$253,900.00
<b>Total</b>	<b>\$600,000.00</b>	<b>\$600,000.00</b>	<b>\$1,200,000.00</b>

Next, in order to determine the amount of operating profit for each customer group, product costs were subtracted from revenues. Table 7 presents the operating profit for each customer group.

Table 7. Profitability Analysis

Cost Object	Revenues	Product Cost	Operating Profit
New	\$290,000.00	\$447,180.00	-\$157,180.00
Short-term	\$285,000.00	\$250,450.00	\$34,550.00
Mid-term	\$235,000.00	\$248,480.00	-\$13,480.00
Long-term	\$190,000.00	\$253,900.00	-\$63,890.00
<b>Total</b>	<b>\$1,000,000.00</b>	<b>\$1,200,000.00</b>	<b>\$-200,000.00</b>

As anticipated by SuperTools.com's management, the newly acquired customers, because of previously-mentioned high acquisition costs, showed a highly negative operating profit. The operating profit for established ("short-term") customers was positive, while "mid-term" and "long-term" customers once again showed negative profits. Perhaps the most important realization from the ABC analysis was that the current strategy of simply waiting until the unprofitable customers became profitable was not likely to lead SuperTools.com into profitability.

The next step for SuperTools.com's management was to validate the results of the ABC analysis by performing the analysis for seven additional quarters. This helped to confirm that the results of the initial analysis were not specific to a given quarter. After the analysis of additional quarters showed similar results, SuperTools.com's management was challenged to develop and implement a new corporate strategy.

There are many options for SuperTools.com's management to better control their costs. For example, a substantial portion of their overhead costs (as well as direct costs) are attributed to erroneous order processing and mistakes in shipping. Many of SuperTools.com's shipments include items which have not actually been ordered, or are missing items which had been. These mistakes, along with slow (and sometimes unprofessional) handling of customer complaints, result in multiple calls and e-mails expressing dissatisfaction. Initial investigation revealed that SuperTools.com's customer complaint rate is substantially higher than those of established "brick-and-mortar" mail-order firms. Improvements in order processing and handling of customer complaints are but two of SuperTools.com's many options for improvement

#### 4. Conclusions

The previous example shows that ABC is also useful to companies from the New Economy. The ABC system will lead companies from the New Economy to establish well-founded business strategies. The ABC analysis enables managers not only to more reliably measure costs associated with e-commerce, but also provides them with more of an understanding of how these costs are generated. Managers may then use the ABC analysis to investigate different methods of regulating their business. They can compare different options regarding their handling of customers, product lines, and distribution methods.

Overall, it is expected that companies engaged in e-commerce will benefit from ABC implementation, specifically, in the improvements of their overall business strategy. For many e-businesses, the ABC system may be an important move from management-by-intuition to management by principles. For example, the next logical step after the implementation of ABC would be up-grading the ABC system by adding an Economic Value Added component [9]. This sophisticated Integrated ABC-and-EVA Information System [8] would build upon the initial improvements made to the e-business by the implementation of ABC.

#### References

1. Cooper, R., 1987, "The Two-Stage Procedure in Cost Accounting - Part One," *Journal of Cost Management*, Vol. 1, No. 2, pp. 43-51.
2. Cooper, R., 1987, "The Two-Stage Procedure in Cost Accounting - Part Two," *Journal of Cost Management*, Vol. 1, No. 3, pp. 39-45.
3. Cooper, R., 1988, "The Rise of Activity-Based Costing - Part One: What Is an Activity-Based Cost System?," *Journal of Cost Management*, Vol. 2, No. 2, pp. 45-54.
4. Cooper, R., 1989, "The Rise of Activity-Based Costing - Part Four: What Do Activity-Based Cost Systems Look Like?," *Journal of Cost Management*, Vol. 3, No. 1, pp. 38-49.
5. Cooper, R., 1989, "The Rise of Activity-Based Costing - Part Three: How Many Cost Drivers Do You Need, and How Do You Select Them?," *Journal of Cost Management*, Vol. 2, No. 4, pp. 34-46.
6. Cooper, R. and Kaplan, R. S., 1991, "Profit Priorities From Activity-Based Costing," *Harvard Business Review*, Vol. 69, No. 3, pp. 130-135.
7. Johnson, H. T., 1990, "Activity Management: Reviewing the Past and Future of Cost Management," *Journal of Cost Management*, Vol. 3, No. 4, pp. 4-7.
8. Roztocki, N., 2000, "The Integrated Activity-Based Costing and Economic Value Added Information System," *Proceedings from the 2000 SAM International Management Conference*, The Society for Advancement of Management (SAM), pp. 513-20.
9. Roztocki, N. and Needy, K. L., 1999, "Integrating Activity-Based Costing and Economic Value Added in Manufacturing," *Engineering Management Journal*, Vol. 11, No. 2, pp. 17-22.
10. Roztocki, N., Valenzuela, J. F., Porter, J. D., Monk, R. M., and Needy, K. L., 1999, "A Procedure for Smooth Implementation of Activity Based Costing in Small Companies," *Proceedings from the 1999 ASEM National Conference*, American Society for Engineering Management, pp. 279-88.